INDIA RUBBER WORLD

NATURAL & SYNTHETIC

OCTOBER, 1943

A BILL BROTHERS PUBLICATION

Newsletter No. 10
OCTOBER, 1943

Published by Rubber Chemicals Division of DU PONT

CONVERT TO NEOPRENE LATEX NOW

YOUR major problem today is that of converting your production from natural rubber to some other elastomer. In the latex field the choice of an elastomer emulsion is limited by the special equipment available for handling latex and the particular requirements of most of the products which are to be made. Neoprene latex possesses all of the necessary qualifications to replace natural rubber latex and in addition, imparts to the finished product those improved properties for which neoprene is noted.

With slight variations in compounding and manufacturing technique, Neoprene Latex Type 571, the general purpose neoprene latex, may be adopted for practically any articles that have been made in the past from natural rubber latex. Neoprene latex compounds perform satisfactorily in all of the customary processes used for manufacturing articles from natural rubber latex; typical methods of processing neoprene latex include straight and coagulant dipping, gelation molding, spraying, coating, impregnating, whipping into foam sponge and extruding for thread.

Most manufacturers of latex products know the extent to which neoprene latex may be used in dipped goods to produce products of excellent quality. Production of molded articles from neoprene latex has also received general recognition. A few of the many applications of current interest for neoprene latices are:

ADHESIVES— having widely varying degrees of tackiness and capable of producing high initial and final bonds may be produced from Neoprene Latex Type 571. The use of chemical plasticizers and tackifiers has played an important part in the development of neoprene latex adhesives for a wide variety of services.

COATINGS AND IMPREGNATED PRODUCTS— of wide application are made with neoprene latex. Compounds of different types are employed as binders for aggregates of fibrous materials and as coatings in the manufacture of shock pads, gaskets and many other products. The service rendered is outstanding, particularly where exposed to oils, heat, sunlight, flame and oxidation.

ELASTIC THREAD— may be made from neoprene latex. Neoprene thread has excellent physical properties and may be used to produce elastic webbing and related articles having many advantages over similar rubber products. Outstandingly long life under normal aging conditions and resistance to deterioration in sunlight and in dry cleaning solvents are inherent properties of thread made from either neoprene latex or dry neoprene.

FOAM SPONGE— of excellent quality may be made from Neoprene Latex Type 60 which is a specialty product recommended primarily for this use. In addition to the usual chemical and flame resistant advantages inherent in all neoprene products, laboratory tests indicate that neoprene foam sponge has an unusually high shock absorbing capacity.

Almost every conceivable type of product has been made from neoprene latex in our laboratory and many of these have been and are being made on a production scale in various plants throughout the country. We shall be very happy to work with you during this critical period and to assist in converting your production to neoprene latex. Bring your latex conversion problems to us. We are sure we can help you.

Through the mill

P.S. Don't forget there is a plus feature in converting from rubber latex to neoprene latex. Not only do vulcanizates from neoprene latex resemble rubber in strength, toughness, resilience and other physical properties but in addition they are inherently resistant to oils, chemicals, heat, flame, sunlight and oxidation—all of which are natural enemies of rubber.

GR-S TIRES The background of service experience being built up by tires made with 2-MT—Accelerator 808 accelerated GR-S stocks confirms the wisdom of this acceleration choice. If you are not thoroughly satisfied with your GR-S tires, ask us to demonstrate the advantages of 2-MT–808 acceleration.

MECHANICAL GOODS Conversion from natural to synthetic rubber is either an accomplished fact or a "headache" of the immediate future. Neoprene Type GN, or GR-M, has been classified as a general purpose synthetic by the War Production Board. In neoprene you have the best answer to your conversion problems. Ease of processing, excellent molding qualities and inherent tackiness for building operations make it most adaptable. Our field representatives and laboratory staff are available to help solve your conversion problems.

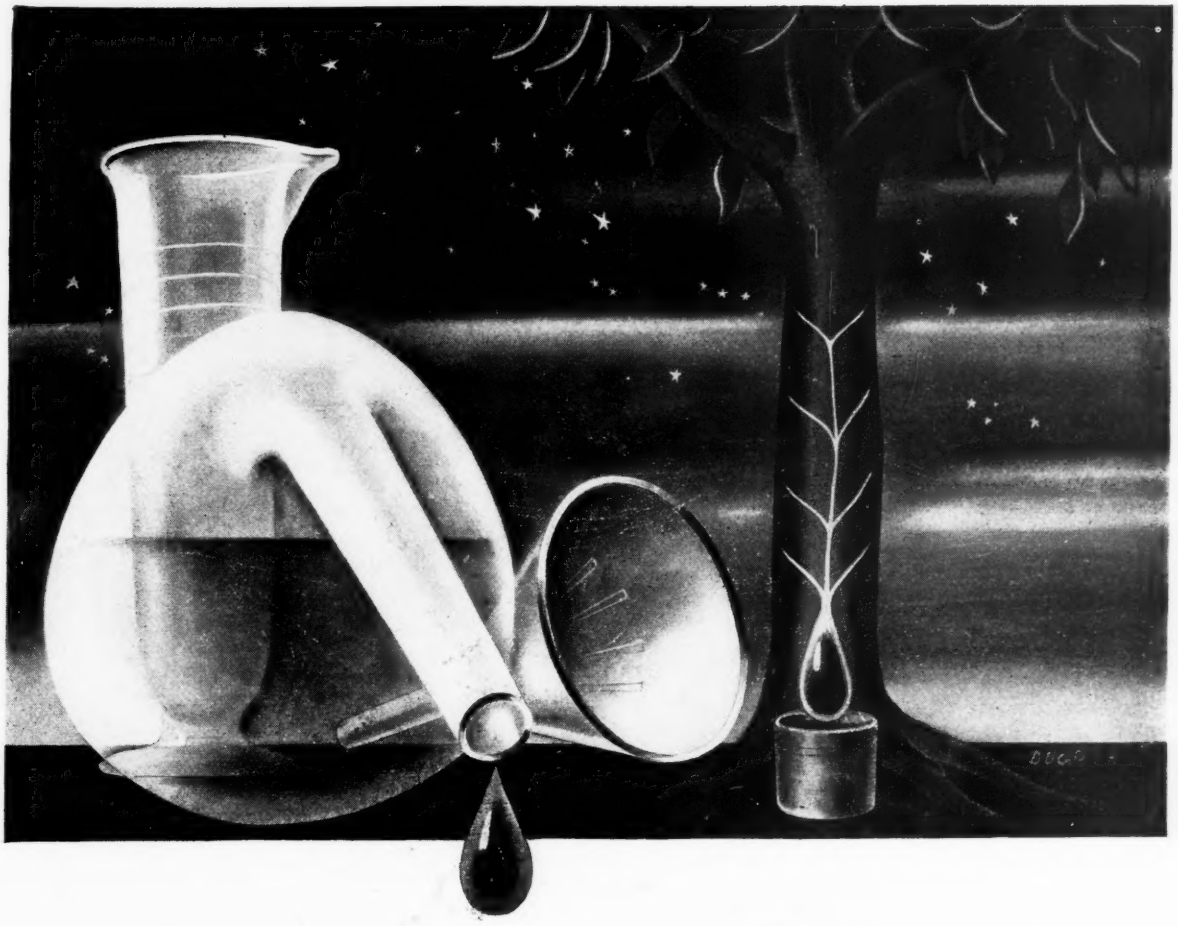
★ BACK THE ATTACK WITH WAR BONDS ★

DU PONT

RUBBER CHEMICALS DIVISION

BETTER THINGS FOR BETTER LIVING . . . Through Chemistry

INDIA RUBBER WORLD, October, 1943, Vol. 109, No. 1. Published monthly by BILL BROTHERS PUBLISHING CORP., 1309 Noble Street, Philadelphia 23, Pa. Editorial and advertising offices, 386 Fourth Avenue, New York 16, N. Y., U. S. A. Entered as second-class matter October 5, 1889, at the Post Office at Philadelphia, Pa., under the act of March 3, 1879. Subscription, United States and Mexico, $3.00 per year; all other countries, $4.00; single copies, 35 cents.



SO ALIKE ★ ★ YET SO *Different!*

For a long time the rubber industry has stopped thinking of synthetic rubber as merely rubber—for "rubber" is a very inadequate name for the amazing synthetic materials that are being used to replace the natural product. In these "synthetics" science has not only given us workable substitutes for natural rubber—it has produced a whole new group of raw materials with unique and individual characteristics. And it is in this *difference* in physical properties that their greatest future potential lies.

The difference is evident in the increasing number and variety of new pigments and compounding techniques required to give synthetics the qualities necessary for successful application in various fields. This job is as important as the discovery of new synthetics themselves. And it is a job in which Wishnick-Tumpeer, Inc. is proving to be highly efficient.

Chemists in Wishnick-Tumpeer's Research Laboratories, working hand-in-hand with the rubber industry, have made available such greatly needed materials as Witco Carbon Black No. 12, which helps to reduce the danger of heat generation in heavy-duty tires...Witco Softener No. 20, a plasticizer that improves tear resistance in tire treads and saves milling time...Stearite, a specially effective dispersing and vulcanizing aid...Witcarb, a remarkable filler that increases tensile and wear resistance of the synthetics.

In working so closely with the rubber industry Wishnick-Tumpeer, Inc., has become an integral part of that great industry. Perhaps you can benefit by the experienced assistance our laboratory staff can give you in adapting synthetic rubbers to your specific requirements.

WITCO

WISHNICK-TUMPEER, INC. MANUFACTURERS AND EXPORTERS

New York 17, 295 Madison Ave. • Boston 9, 141 Milk St. • Chicago 11, Tribune Tower • Cleveland 14, 616 St. Clair Ave., N. E.

Witco Affiliates: The Pioneer Asphalt Company • Panhandle Carbon Company • Foreign Office, London, England

CHEMICALS • PIGMENTS • ASPHALTUMS

When the **HEAT** is on...

YOUR products are helping win this war . . . Without precious rubber fire hose, the Four Horsemen of Disaster — incendiary bombs, explosion fires, sabotage and accident—could run their damaging course unchecked.

Rubber hose has won its service stripes time and time again, saving lives, ships and cargoes for Uncle Sam.

Industry is fully aware of the importance of turning out rubber hose for this and other applications. Naturally, rubber hose manufacturers choose equipment whose record is one of efficiency and dependability . . . and Robertson equipment is used by the majority of makers of rubber hose in the Western Hemisphere!

Every day . . . miles of uncured rubber hose pass through Robertson presses and are perfectly lead sheathed — ready for vulcanizing.

COMPLETE INSTALLATIONS of Robertson hose lead encasing and stripping equipment make the perfectly correlated operating units found most satisfactory by leading rubber hose manufacturers. Installation and maintenance are simplified; responsibility is undivided; and operation is as one perfectly integrated unit.

JOHN ROBERTSON COMPANY, INC.
131 Water Street, Brooklyn 1, N. Y.

ROBERTSON

Established 1858 - **Designers and builders of Lead Encasing Machines and Hydraulic Equipment, Including Extrusion Presses, Hydraulic Pumps, Melting Furnaces and Pots, Dies and Cores, Hydro-Pneumatic Accumulators, Lead Sheath Stripping Machines, and Special Equipment for Special Uses.**

ACCELERATION FOR GR-S

specify

NAUGATUCK CHEMICAL

For any Product or Problem with GR-S
There is a Naugatuck Accelerator

- **1—THIAZOLES**
  B·J·F—M·B·T—M·B·T·S—O·X·A·F
- **2—THIURAMS**
  MONEX—PENTEX—TUEX
- **3—ALDEHYDE AMINES**
  BEUTENE—HEPTEEN BASE—TRIMENE BASE
- **4—DITHIOCARBAMATES**
  ARAZATE—BUTAZATE—ETHAZATE
  METHAZATE—PIPAZATE—SAFEX
- **5—XANTHATES**
  C·P·B—Z·B·X
- **6—ACTIVATORS**
  D·B·A—DELAC P

PROCESS—ACCELERATE—PROTECT with Naugatuck Chemicals

Naugatuck Chemical

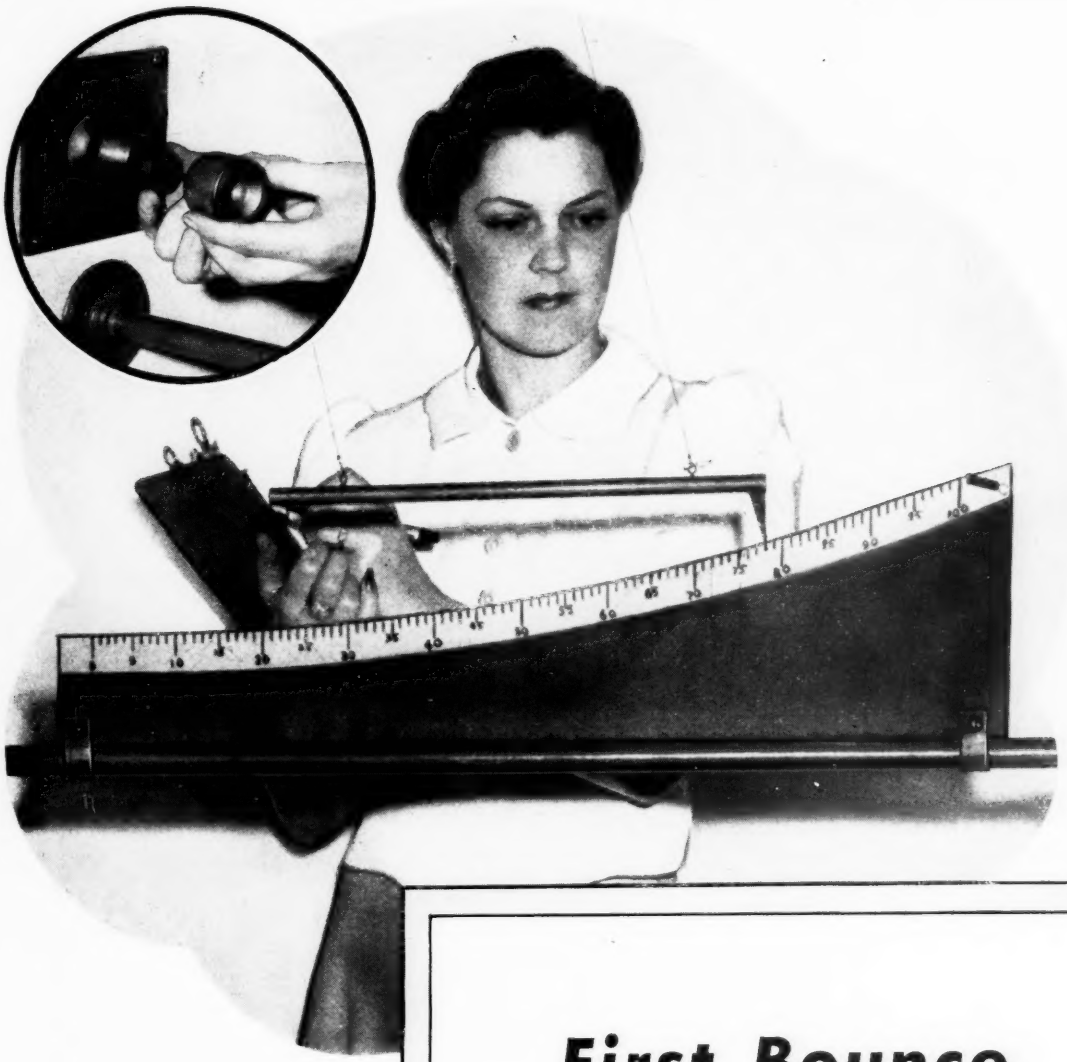
DIVISION OF UNITED STATES RUBBER COMPANY
ROCKEFELLER CENTER NEW YORK, N. Y.

IN CANADA: *Naugatuck Chemicals Limited, Elmira, Ont.*

Military Objectives

War-time research . . . born of stark necessity . . . has a wholly military objective. It has not tried to alter America's post-war industry. But already it has altered it almost beyond possibility of recognition. Under its continued stimulus new industries will spring up . . . competitive situations will alter . . . new products and new leaders will arise. Contact with war-time research affecting YOUR industry will enable you to keep pace with these startling post-war developments. Stanley chemists have pioneered in the field of coatings. Intricate problems relating to war-time finishes have been solved . . . uncovering startling developments which, when the war is won, may well revolutionize YOUR peace-time products. Be prepared . . . participate in present research by securing now the answers to your war-time finishing problems. When the war ends . . . you will be ready for their post-war application. Your inquiry incurs no obligation. Address The Stanley Chemical Company . . . manufacturers of Stanley Lacquers, Enamels, Synthetics and Japans . . . East Berlin, Connecticut.

Stanley Chemical



First Bounce

HERE a sample of Hycar stock is undergoing tests in the Lupke Resiliometer. The end use of this particular stock requires high resilience, and the indicator shows it's going to have plenty of bounce.

Technical men in the rubber industry are familiar with this rebound test. But they may not be aware of the completeness of the facilities offered to them for developing, testing and perfecting their Hycar stocks at our Customer Service Laboratory.

Here, for the advancement of research and improvement of products, is a complete, fully equipped, fully staffed laboratory devoted entirely to customer problems. We will welcome the opportunity of cooperating with you. *Hycar Chemical Company, Akron 8, Ohio.*

LIMITED QUANTITIES OF HYCAR **are now available for experimental purposes without WPB allocations. Individual orders may not exceed 25 pounds per month.**

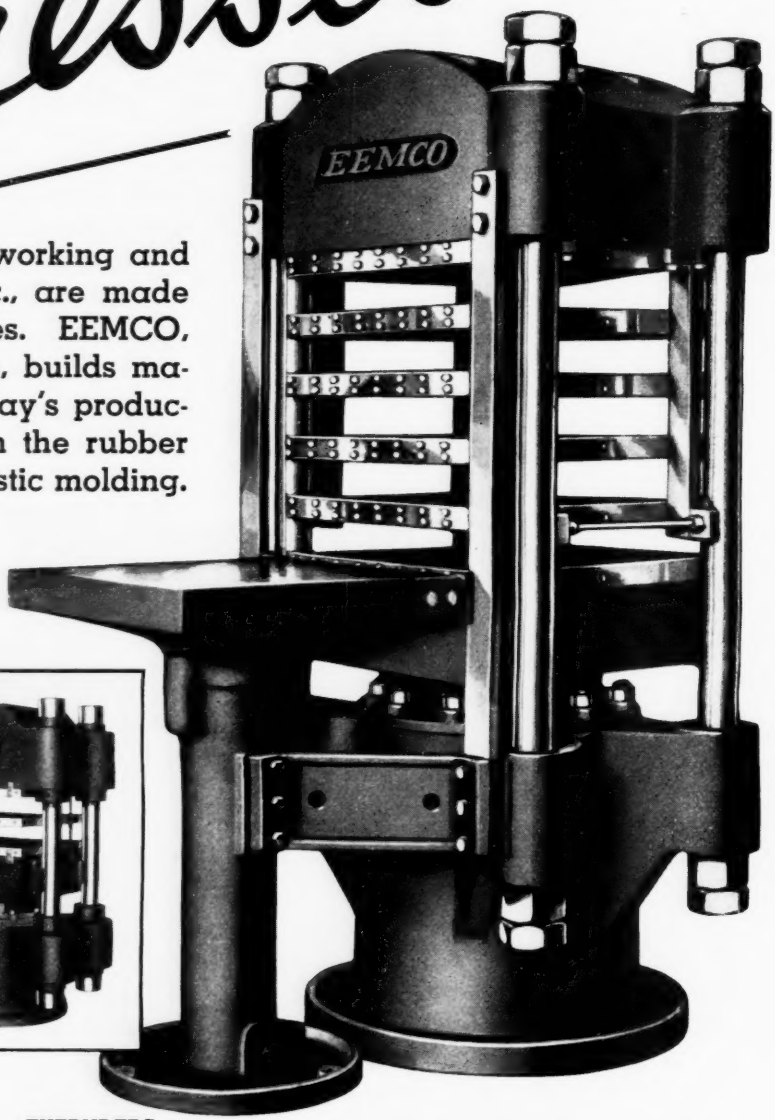
Hycar

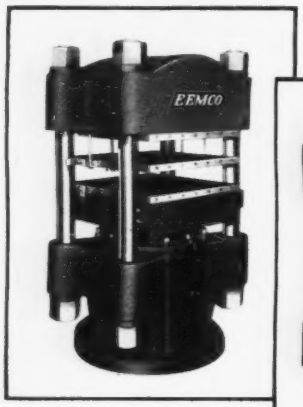
LARGEST PRIVATE PRODUCER OF

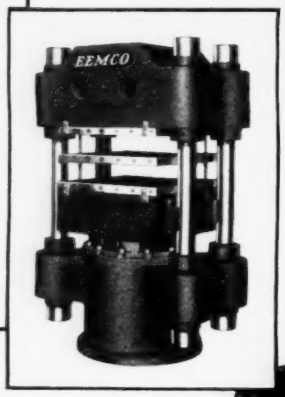
BUTADIENE *Synthetic Rubber* IN AMERICA

Presses

Presses for rubber working and plastic molding, etc., are made by EEMCO in all sizes. EEMCO, successors to Nagle, builds machinery to meet today's production requirements in the rubber industry and for plastic molding.







Manufacturers of:

MILLS - REFINERS - TUBERS - EXTRUDERS
STRAINERS - HYDRAULIC PRESSES
CALENDERS - CRACKERS - WASHERS

An inquiry on your letter-head will bring literature by return mail

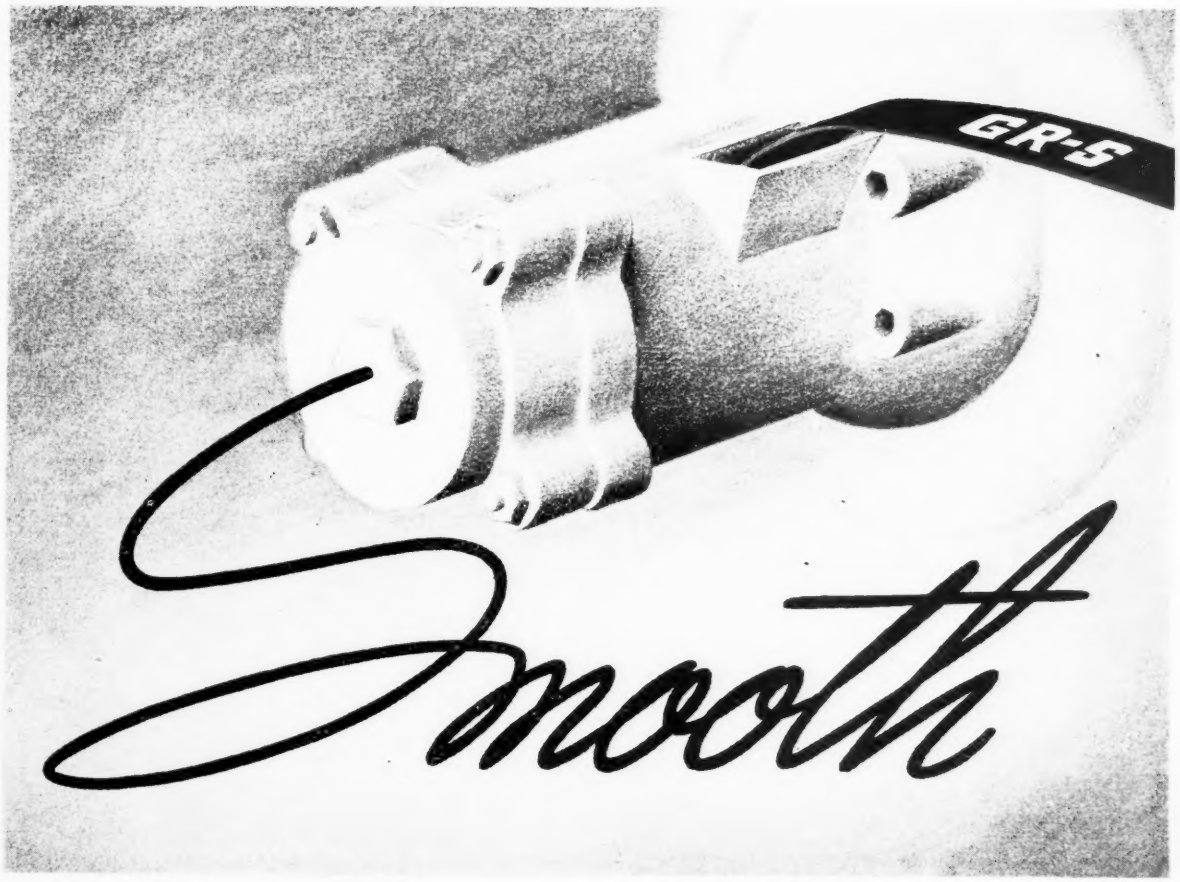
EEMCO *SUCCESSOR TO "NAGLE"*

ERIE ENGINE & MFG. CO.

953 EAST 12th ST., ERIE, PENNA.

NAFTOLEN . . . *the solution to your*

GR-S Extrusion Problems



Smooth extrusion of GR-S stocks can be obtained through the use of large proportions of NAFTOLEN (50 or more parts for every 100 parts of GR-S). The NAFTOLEN swells the GR-S, reducing the "nerve" of the stock to a minimum. NAFTOLEN is an unsaturated hydrocarbon which reacts with sulfur during vulcanization. Therefore proper sulfur is necessary for optimum results.

WILMINGTON CHEMICAL CORPORATION

10 East 40th Street, New York 16, N. Y.

Plant and Laboratory: Wilmington, Delaware

W C=C

REG. U. S. PAT. OFFICE

HYDRATED ALUMINA C-741

gives rubber high strength needed for severe stripping

High strength at elevated temperatures. Hydrated Alumina C-741 reinforcing pigment gives rubber this highly desirable characteristic. Products come off the molds without tearing. The work goes fast and rejections are low. Finished rubber is tough, resilient, and highly resistant to tear and aging. It has low heat build-up and good heat transfer.

Rubber compounded with Hydrated Alumina C-741 has a high modulus in the uncured stock, with unusually good tackiness. For many rubber products, higher pigment loadings are possible and additional diluents can be used. You are able to conserve badly-needed crude rubber while retaining the physical qualities required by Federal specifications.

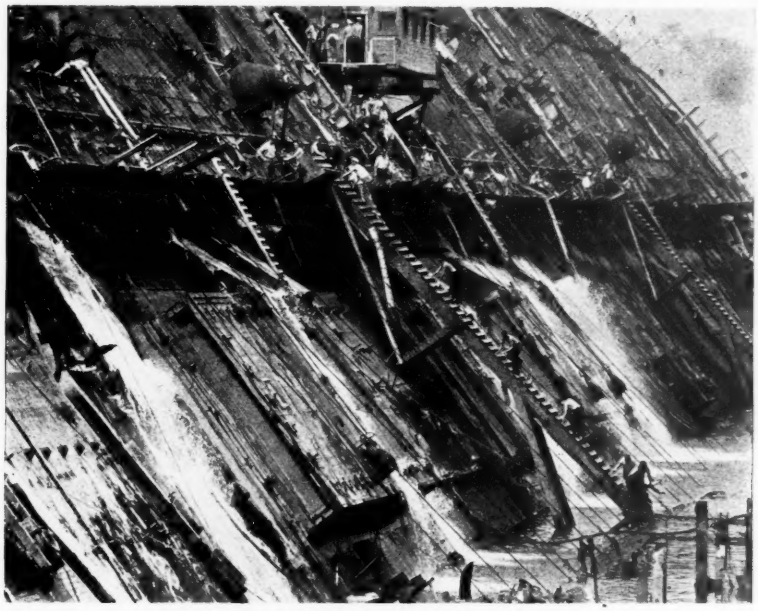
If you are making rubber products which are used in the war effort, you should investigate the use of Hydrated Alumina C-741 as a reinforcing pigment. We'll send you samples for trial. Write ALUMINUM COMPANY OF AMERICA (*Sales Agent for* ALUMINUM ORE COMPANY) 1909 Gulf Building, Pittsburgh, Pennsylvania.

ALORCO

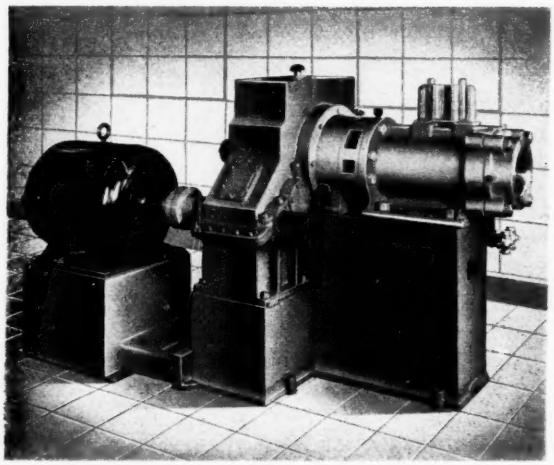
ALUMINUM ORE COMPANY

ALUMINUM AND FLUORINE COMPOUNDS

THE WORLD'S GREATEST SALVAGE JOB RELIES HEAVILY ON EXTRUDED RUBBER



PUMPING OUT THE "NORMANDIE"



From the start of the salvage work on the huge "U. S. S. Lafayette"—formerly the "Normandie" of the French Line, extruded hose played a major role.

Divers who first examined the submerged hull used thousands of feet of hose.

Workers, inside and outside the ship, used hose for riveting and power tools.

And as the big ship began to come up it was rubber hose that drained the water from her compartments. Until she is restored to use extruded hose will be continuously employed in the work of reconstruction.

ROYLE EXTRUDERS

have been used and approved by manufacturers of hose for half a century.

JOHN ROYLE & SONS

PATERSON 3 NEW JERSEY

BUILDERS OF A LINE OF GREAT EXTRUDERS FOR RUBBER AND PLASTICS

ROYLE PATERSON N.J.

AKRON, OHIO
Represented by J. C. CLINEFELTER
UNIVERSITY 3726

LONDON, ENG.
Represented by JAMES DAY
(MACHINERY) LTD.

JAR RINGS ALSO SERVE

In the face of restrictions, greater demand and changing formulations, Pequanoc Rubber Company still aids the jar ring manufacturers in getting this essential product into the kitchens of America.

For many years we have supplied special Reclaims for jar rings and continue to meet present day problems of the industry.

PEQUANOC RUBBER CO.

QUALITY RECLAIMS FOR SPECIFIC PURPOSES

BUTLER NEW JERSEY

SALES REPRESENTATIVES

Robert Knoblock
2301 Lincoln Way West
Mishawaka, Indiana

Harold P. Fuller
31 St. James Avenue
Boston, Mass.

Burnett & Co. (London) Ltd.
189 Regent Street
London W. 1, England

TIME TO CROW

...when we're in Tokio!

Feeling cocky about the war?
Better not . . . you can't crow
without sticking your neck out!

. . .

Sure, there have been . . . and there will be . . . successes along the road to Victory. But these must not make any of us over-confident.

Rome. Even Berlin! Just milestones on the long, hard road to Tokio. With a fanatical foe contesting every inch of the way!

Only a tidal wave of men, materiel and money will engulf Japan!

To help swell this wave, American industry must have . . . at once: WOMEN . . . by the many thousands to take the places of men gone to war.

Even more important . . . EFFORT to the point of sacrifice on the part of every man and woman in industry . . . workers and bosses.

Another must . . . DOLLARS! . . . And the coming Victory Loan is a further opportunity to show our enemies what their fate shall be.

. . .

Crow? Sure! But only in Tokio!

Carrier
Syracuse, N. Y.

Makers of Air Conditioning and Refrigeration Equipment

● *This message in poster form for use on factory bulletin boards is available upon request.*

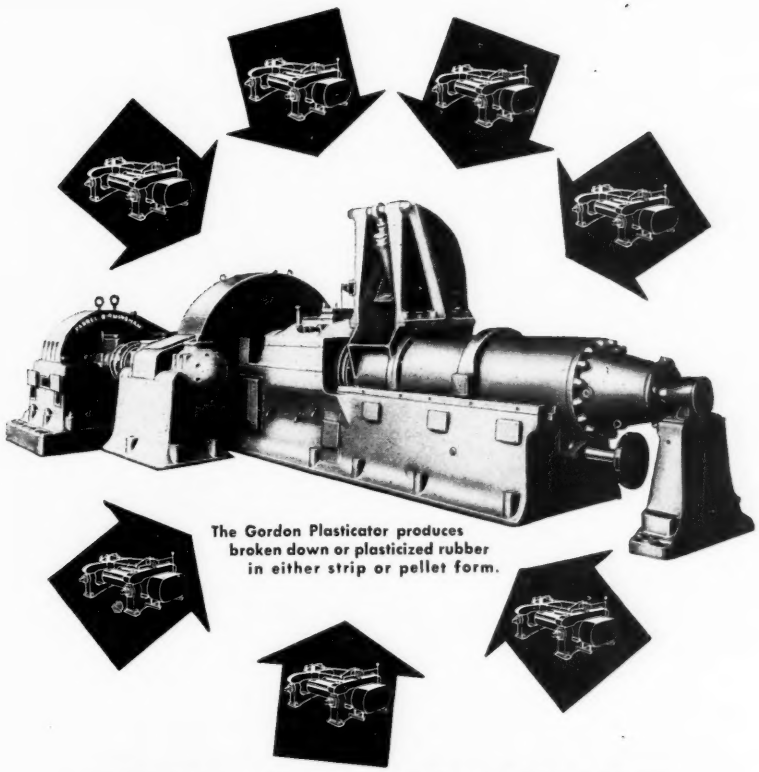
Good Will in Every Shipment

Every bag or barrel of St. Joe Zinc oxide contains an invisible but valuable ingredient—Good Will. The pigment's consistent high quality builds Good Will for us among our customers. Our control of production from zinc ore to zinc oxide, by a patented electro-thermic process, ensures the maintenance of the uniform high quality that has made ST. JOE Lead-Free ZINC OXIDES famous throughout the consuming industries.

ST. JOSEPH LEAD COMPANY

250 PARK AVE., NEW YORK, N. Y.

MADE BY THE LARGEST PRODUCER OF LEAD IN THE UNITED STATES



The Gordon Plasticator produces broken down or plasticized rubber in either strip or pellet form.

HERE IS A MACHINE THAT DOES THE WORK OF SEVEN 84" ROLL MILLS

One cause of the high cost of production in some rubber plants can be traced to the use of *general-purpose* roll mills for breaking down crude rubber—machines suitable for a wide range of applications but lacking the high efficiency of a machine designed for a specific use. The Gordon Plasticator, on the other hand, is a *single-purpose* machine designed specifically for high output and low-cost production of broken-down rubber.

The 20" size, which is the largest Gordon Plasticator built, has a capacity of 8600 lbs. of preheated smoked sheet per hour on first pass, using ordinary breakdown methods and temperatures. This is equivalent to the output of seven 84" roll mills breaking down to the same degree of plasticity. With the hot breakdown, 10,000 lbs. per hour can be produced, with no second pass needed for average uses.

Other sizes include the 15", with a capacity of 4400 lbs. per hour; the 12", which has an output of 2400 lbs.; and a 3" size for laboratory use.

Plants using the Gordon Plasticator find that they obtain improved plasticity as well as a high rate of production at low cost. Write for complete details.

PROCESS EQUIPMENT for RUBBER and PLASTICS

F-B PRODUCTION UNITS

Banbury Mixers—Plasticators—Pelletizers—Mixing, Grinding, Warming and Sheeting Mills—Bale Cutters—Tubing Machines—Refiners—Crackers—Washers—Calenders—Hose Machines—Hydraulic Presses—and other rubber working equipment.

FARREL-BIRMINGHAM COMPANY, INC.

ANSONIA, CONN.

Plants: Ansonia and Derby, Conn., Buffalo, N. Y. — Branch Offices: New York, Buffalo, Pittsburgh, Akron, Los Angeles

NEVILLE

NEVILLE CHEMICALS

Serving the RUBBER INDUSTRY

NEVOLL*

Coal-tar softener, formerly widely used in natural rubber, now found to be an effective plasticizer and wetting agent for GR-S to improve resistance to abrasion, tensile strength, elongation and resilience.

COUMARONE RESINS

A number of Rubber Reserve Company's releases on compounding synthetic rubbers contain suggested recipes calling for coumarone resins. They are available in various melting points and colors.

DIBUTYL PHTHALATE

Effective softener for several of the synthetic rubbers, such as Hycar OR, Perbunan, etc., imparting high tensile, low modulus and low set.

RECLAIMING OILS

Several types manufactured for both digestor and pan processes.

COAL-TAR SOLVENTS

Benzol, Tollac* Solvent, Nevsol*, Xylol, 2-50-W* Hi Flash Solvent, Cosol*, and special solvents; for rubber cements and various rubber solutions.

Reg. U. S. Pat. Off.

R-9

THE NEVILLE COMPANY

PITTSBURGH · PA.

Chemicals for the Nation's War Program

BENZOL • TOLUOL • XYLOL • TOLUOL SUBSTITUTES • CRUDE COAL-TAR SOLVENTS
HI-FLASH SOLVENTS • COUMARONE-INDENE RESINS • TERPENE RESINS • TAR PAINTS
RUBBER COMPOUNDING MATERIALS • WIRE ENAMEL THINNERS • DIBUTYL PHTHALATE
RECLAIMING, PLASTICIZING, NEUTRAL, CREOSOTE, AND SHINGLE STAIN OILS

BACKING up the quality of rubber products . . . meeting exacting specifications of an industry with exacting needs . . . that is a task to which MT. VERNON fabrics are dedicated. Modern laboratory control guides every step of their production . . . from the careful selection of top grades of cotton, to highly uniform weaving. When you specify MT. VERNON fabrics, you are backing up the quality of your own products.

MT. VERNON WOODBERRY MILLS, INC.

TURNER HALSEY COMPANY
Selling Agents
40 WORTH STREET ★ NEW YORK, N. Y.
CHICAGO · NEW ORLEANS · ATLANTA · BALTIMORE · BOSTON · LOS ANGELES · SAN FRANCISCO

DETROIT PUBLIC LIBRARY

How to improve tensile strength of GR-S

Tests have shown that Bardol* is compatible with GR-S Rubber (Buna S), functioning as a wetting agent and plasticizer to promote dispersion of sulphur and accelerators in the elastomer.

Manufacturers who use Bardol find that it improves behavior and performance of GR-S compounds, providing higher tensile strength and greater elongation.

Bardol, a coal-tar chemical, is also effective in obtaining these properties:

- **Improved resistance to abrasion.**
- **Better flexibility and resistance to ply separation at low temperatures.**
- **Greater resilience and low hysteresis.**
- **Low permanent and compression set.**

For complete details, wire or write

THE BARRETT DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 RECTOR STREET, NEW YORK

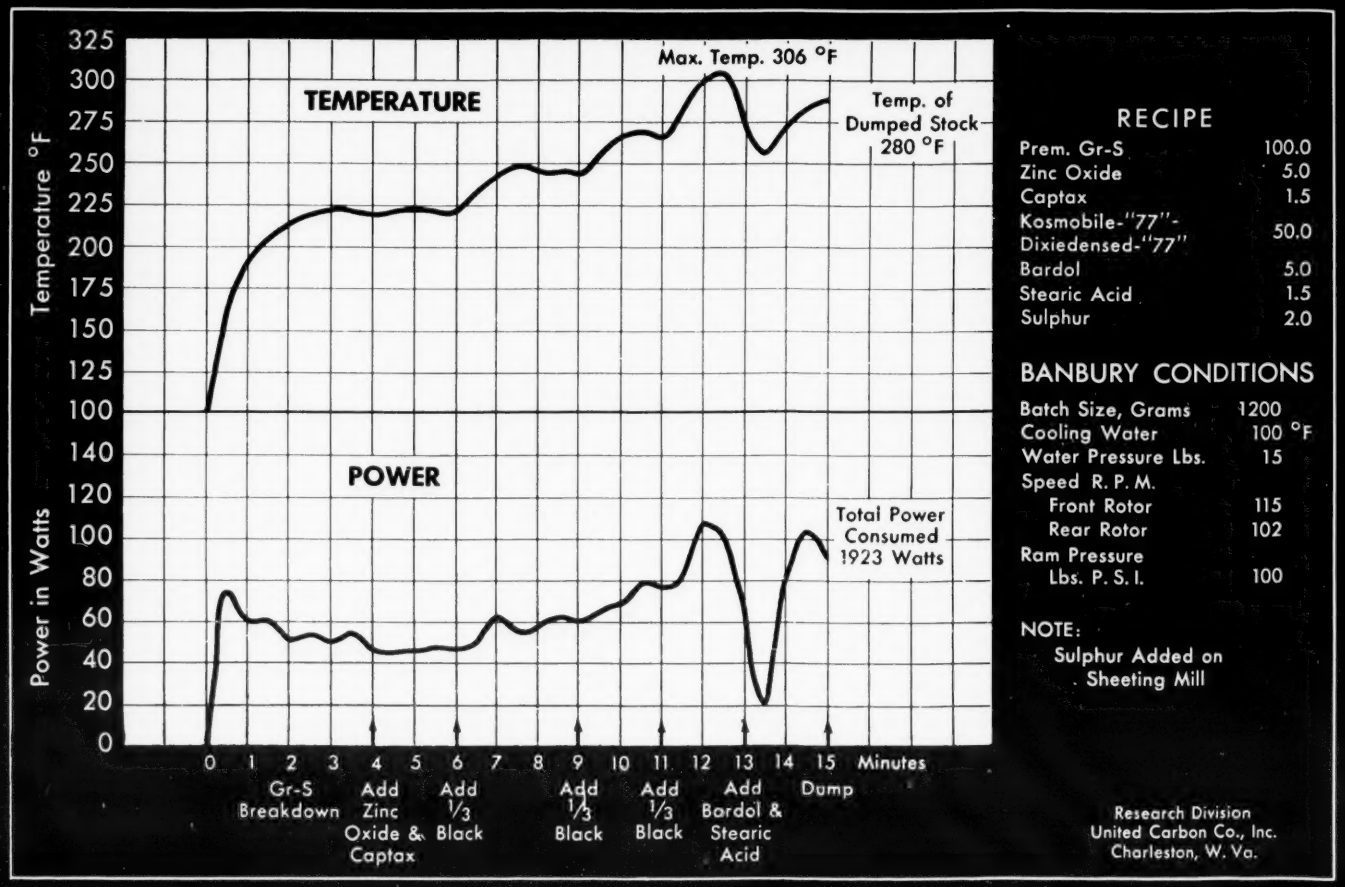
Barrett

ONE OF AMERICA'S GREAT BASIC BUSINESSES

*Reg. U. S. Pat. Off.

PRINTED BY FIELD & STOCK IN A BANBURY

BEHAVIOR OF UNITED BLACKS IN GR-S (BUNA-S) TREAD STOCK IN A BANBURY WITH KOSMOBILE 77–DIXIEDENSED 77



RECIPE

Prem. Gr-S	100.0
Zinc Oxide	5.0
Captax	1.5
Kosmobile-"77"-Dixiedensed-"77"	50.0
Bardol	5.0
Stearic Acid	1.5
Sulphur	2.0

BANBURY CONDITIONS

Batch Size, Grams	1200
Cooling Water	100 °F
Water Pressure Lbs.	15
Speed R. P. M.	
Front Rotor	115
Rear Rotor	102
Ram Pressure Lbs. P. S. I.	100

NOTE:
Sulphur Added on Sheeting Mill

Research Division
United Carbon Co., Inc.
Charleston, W. Va.

This graph speaks for itself. The moderate temperature rise and relative low power consumption, observed in this graph, would be even more pronounced where natural rubber is used with Kosmobile 77-Dixiedensed 77.

UNITED CARBON COMPANY, INC.

Charleston, West Virginia

New York • Akron • Chicago

USE UNITED BLACKS FOR BEST RESULTS

Kosmobile 77-Dixiedensed 77 is the dustless easy processing channel black (EPC) for natural and synthetic rubber. Take advantage of its relatively low power consumption and cool mixing, easy and smooth processing, fast curing, top reinforcement, high rebound, low heat build-up, and dependable performance under all sorts of demands.

Kosmobile 77-Dixiedensed 77 is *the* black for tires. Employ it where your cardinal specifications call for toughness, hardness, and resistance to deterioration by generated heat, abrasion, flexing, and cracking.

Kosmobile 77-Dixiedensed 77 is produced under exacting conditions and carefully controlled for quality and uniformity. To repeat, "Use United blacks for best results."

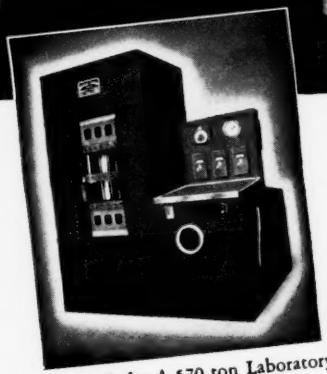
UNITED CARBON COMPANY, INC.

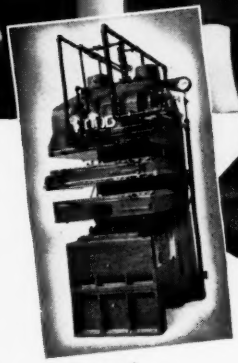
Charleston, West Virginia

New York • Akron • Chicago

HYDRAULIC PRESSES ★★★ *In Any Size!*

From small laboratory presses to the massive production units required for the Plastics and Rubber industries, Wood engineers can design and produce to meet your needs. It will pay you to consult with us on your hydraulic press problems.





Above Left: A 570 ton Laboratory Press with electrically heated platens, two-pressure pumping unit and adjustable pressure control.

Above Right: An open-side belt press of the precision type, with steam-heated platens.

HYDRAULIC PRESSES FOR EVERY PURPOSE

R. D. WOOD CO.

PHILADELPHIA · PENNSYLVANIA

REACHING NEW HEIGHTS...

OPACITY • WHITENESS • BRIGHTNESS • OPACITY • WHITENESS • BRIGHTNESS •

IN VALUE

Only titanium pigments, of which TITANOX is the oldest and most widely used, give all of the benefits on which the value of opaque pigments is based. Principal among these benefits is the ability to produce desired whiteness and brightness with a minimum of pigmentation.

Thus in these times of rising manufacturing costs, the unsurpassed tinting strength of TITANOX contributes to desired economy wherever white pigments are used to whiten or lighten rubber products as for example, in hospital sheetings and gas masks.

This color benefit is permanent and will outlast the use-life of the product because the whiteness of TITANOX pigments is unchanging. This applies equally to synthetics, natural and reclaimed rubber.

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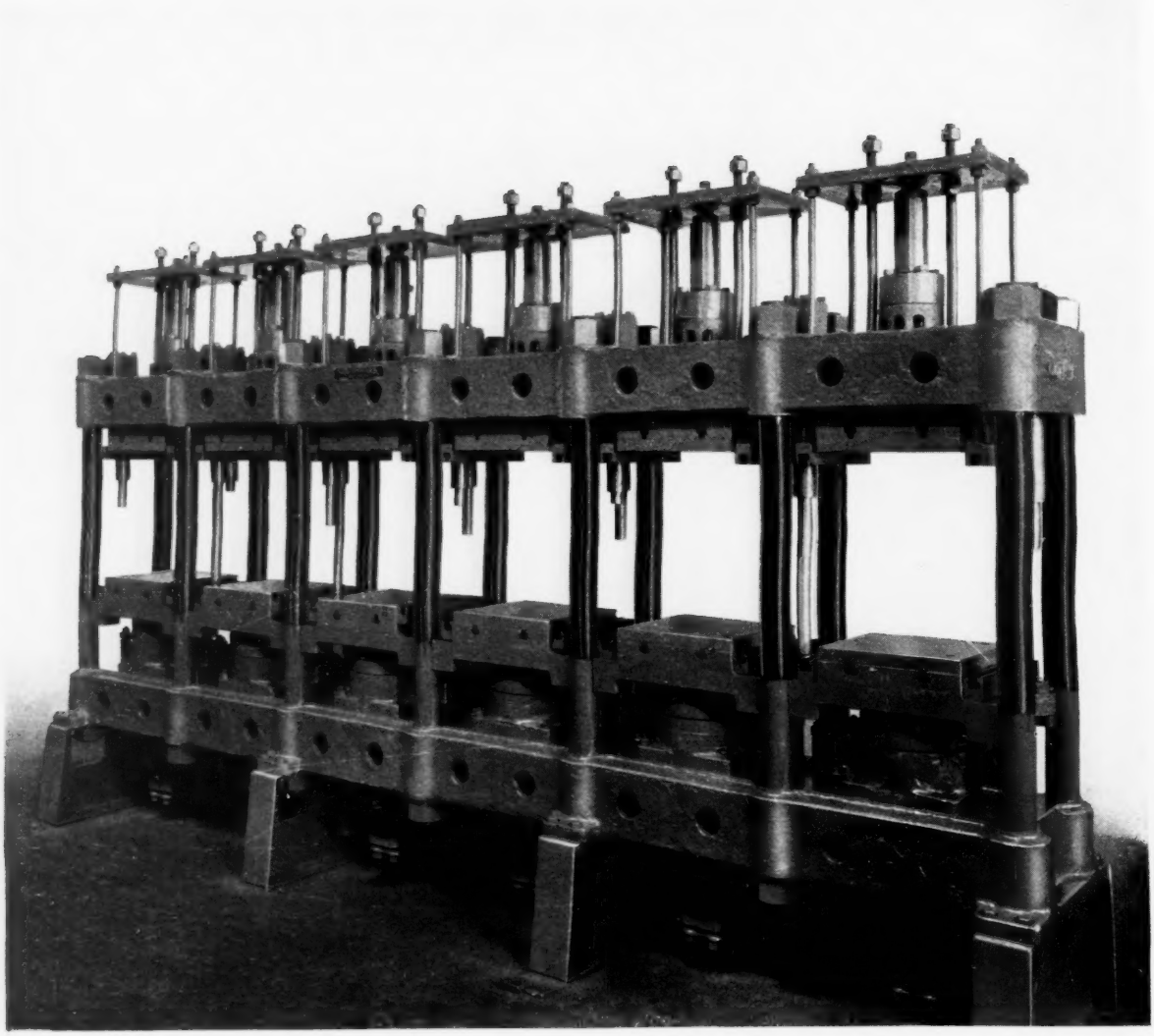

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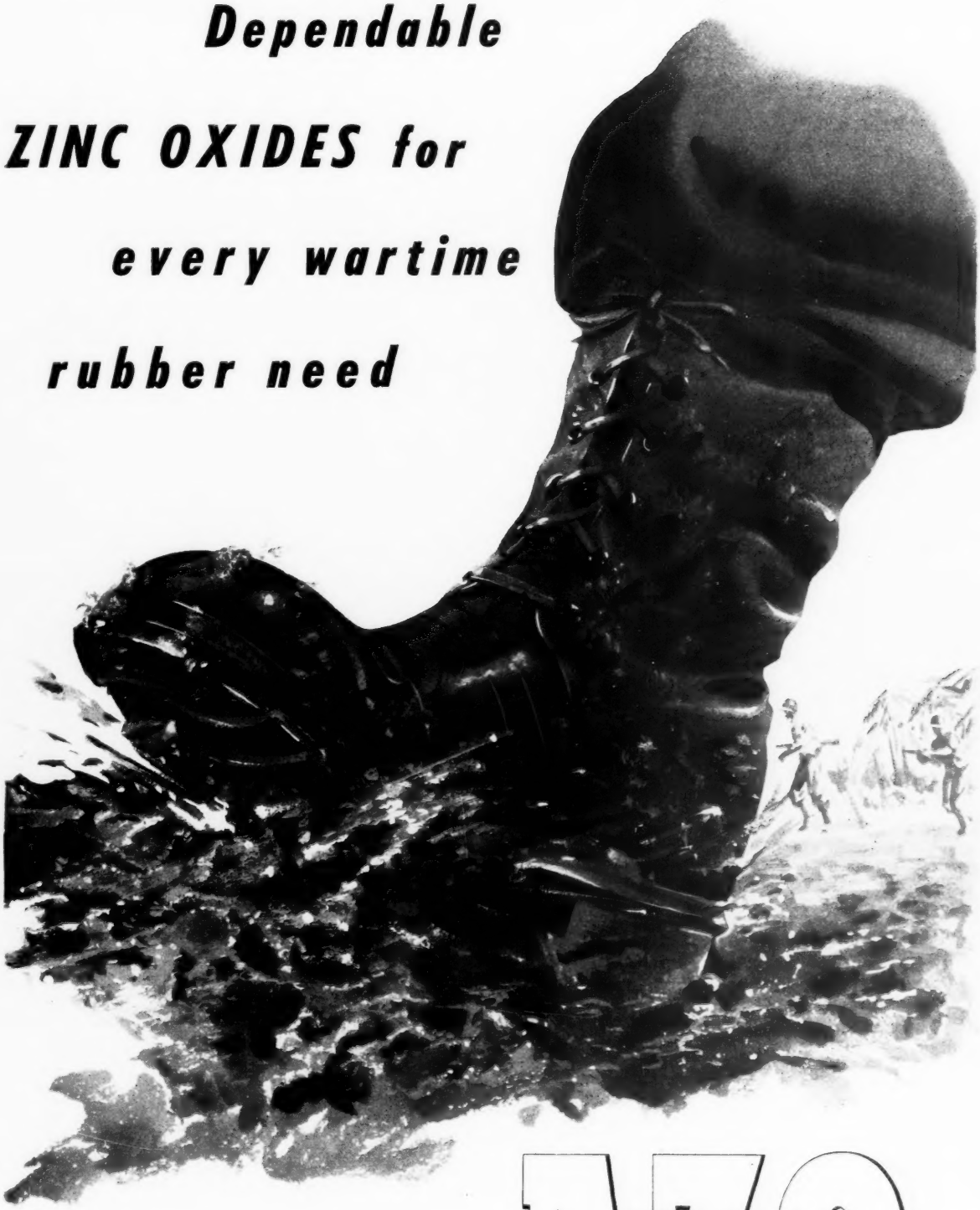

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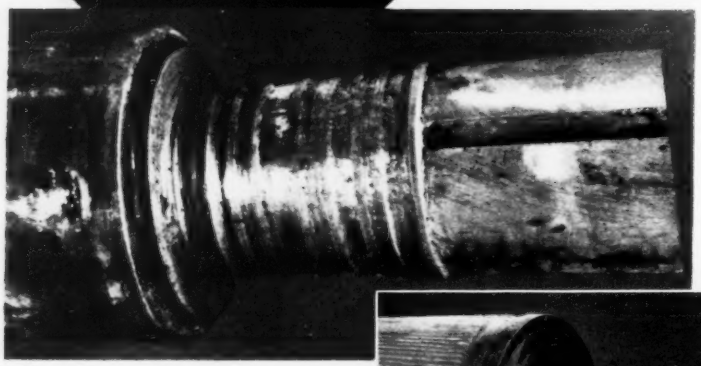

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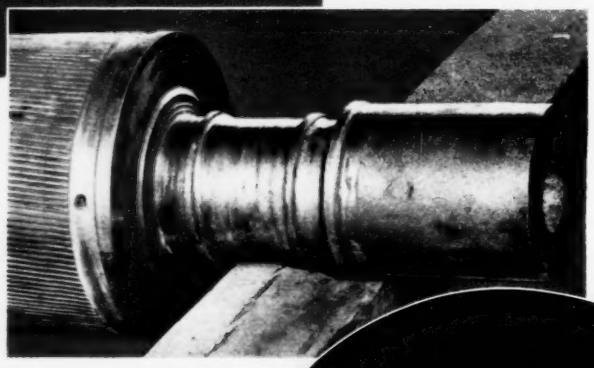

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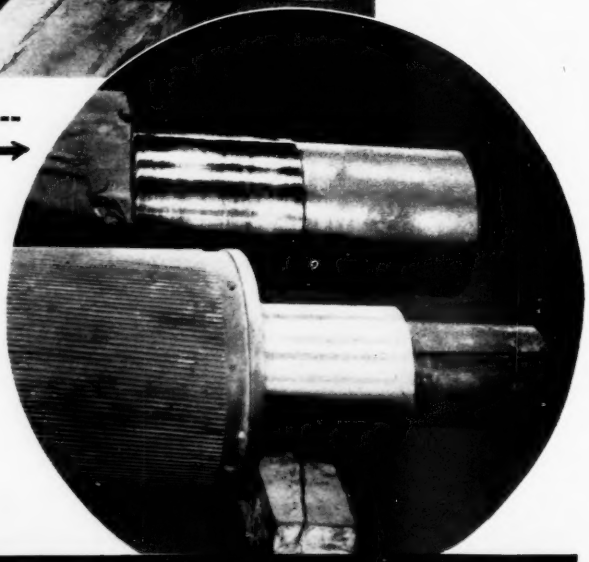

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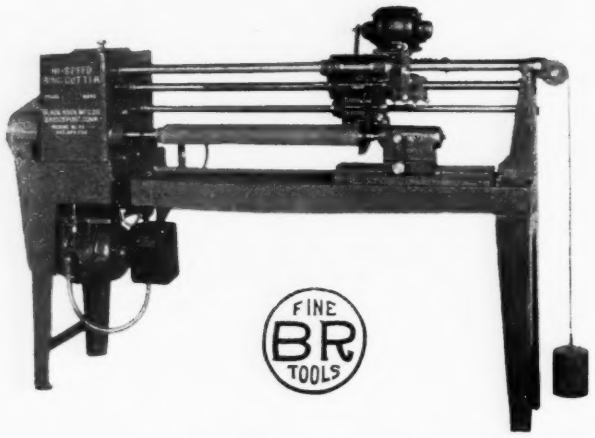

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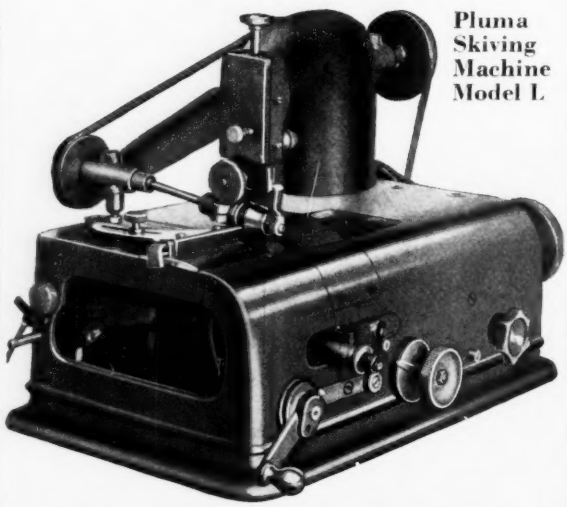

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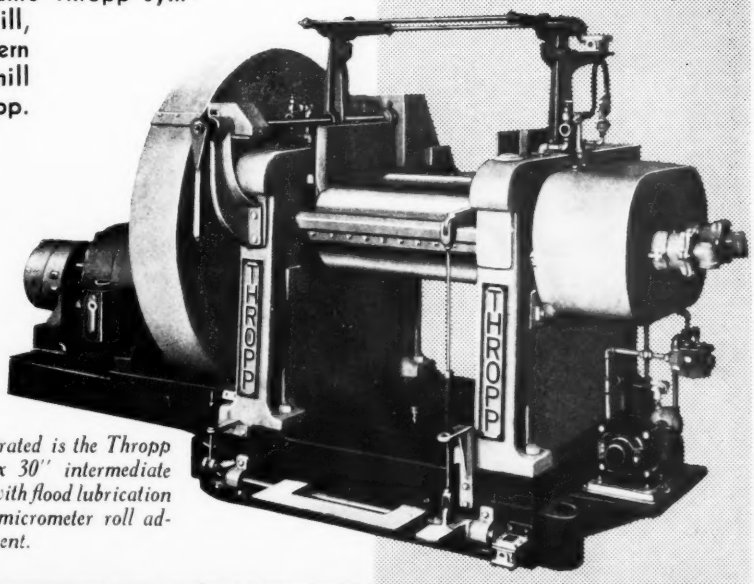

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October, 1943

VOLUME 109 NUMBER 1

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CONTENTS

DEPARTMENTS

	Pages
Editorials	52
What the Rubber Chemists Are Doing	55
New Machines and Appliances	61
Rubber Industry in United States	62
Canada	74
Obituary	76
Patents	78
Trade Marks	80
Rubber Industry in Europe	82
Africa	86
Far East	92
Book Reviews	94
New Publications	96
Rubber Bibliography	98

MARKET REVIEWS

Crude Rubber	76
Reclaimed Rubber	80
Cotton and Fabrics	100
Rubber Scrap	100

STATISTICS

Rims Approved and Branded by The Tire & Rim Association Inc.	80
CLASSIFIED ADVERTISEMENTS	102
ADVERTISERS' INDEX	106

ARTICLES

Compounding Adjustments for Controlling the Variability of GR-S — GEORGE R. VILA and F. L. HOLBROOK 37

Mooney Viscometer Adopted for GR-S Control — 40

Evaluating Low-Temperature Stiffness and Brittle Point in Elastomers — FLOYD L. GRAVES and ARNOLD R. DAVIS 41

Recent Russian Literature on Natural and Synthetic Rubber — IV — M. HOSEH 45

Rubber after the War — IV — K. E. KNORR 49

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Volume 109 **New York, October, 1943** **Number 1**

Compounding Adjustments for Controlling the Variability of GR-S

George R. Vila[1] and F. L. Holbrook[1]

IT IS obvious to everyone by now that the establishment of a synthetic rubber industry in the United States in the course of a few years is a tremendous undertaking. At the outset it is inevitable that some variation in product is likely to occur. As in all manufacturing processes, this variation may be expected to diminish as plants are tuned up, and experience is accumulated. In the meantime the rubber industry cannot wait for perfect rubber, and polymer in any reasonable form is too valuable to be discarded. Consequently the industry is prepared to utilize polymers which may exhibit variations in physical properties and curing rates which are somewhat wider than have been experienced in late years with plantation rubbers. Admittedly this places a heavy burden on the compounder as it will often be desirable to test polymer shipments when received and make compounding adjustments to secure uniform physical characteristics and curing rates.

The present data have been assembled as a contribution to the fund of knowledge covering basic compounding principles for GR-S and are designed to be used for ascertaining what compounding controls may be utilized for smoothing out variations in the raw polymer.

Specification for GR-S

Prior to being released from the various polymerization plants, GR-S must meet certain chemical and physical tests which may be summarized as follows:

I. Chemical Analysis

Test	Specification
A. Acetone extract	10% Maximum
B. Heat loss	0.75% Maximum
C. Fatty acid (as stearic acid)	3.0 to 6.0% Maximum
D. Soap (soluble sodium stearate)	0.75% Maximum
E. Ash	1.50% Maximum

II. Physical Tests

A. Plasticity

Uncompounded Mooney viscosity limits 45 to 55 at 212° F. read four minutes after the motor has been started following a warm up period of one minute. The large rotor shall be used at a temperature of 212° F. A reading at 1½ minutes is also to be taken as a matter of record.

Compounded Mooney Viscosity:

Large rotor (ML) 212° F. at 4′—80 Maximum
Small rotor (MS) 212° F. at 4′—40 Maximum

B. Test Recipe

Polymer as received	100.0
Channel black	50.0
Zinc oxide	5.5
M-B-T	1.0
Sulphur	2.0
Refined coal-tar rubber softener	5.0

C. Curing and Testing

	25′*	50′	90′*
Cure at 292° F.			
Tensile strength	....	2500 p.s.i. minimum	....
Elongation	....	500% minimum	....
Modulus at 300%—minimum	400	800 p.s.i.	1000
Modulus at 300%—maximum	900	1300 p.s.i.	1600

* Recent addition to the specifications.

TABLE I. SUMMARY OF TESTS—NATURAL AND GR-S RUBBER TREAD COMPOUND

	Natural Rubber		GR-S	
	Series #1	Series #2	Series #1	Series #2
Number of Mixes	27	79	51	30
Cure	60′ at 30#	60′ at 30#	60′ at 45#	50′ at 45
300% Modulus*				
Maximum Value	1550	1650	1300	1350
Minimum Value	890	800	330	640
Range	660	850	970	710
Mean	1225	1179	950	875
Standard Deviation	±154	±190	±191	±156
Tensile Strength*				
Maximum Value	4860	4630	3530	3390
Minimum Value	3850	3800	2380	2250
Range	1010	830	1150	1140
Mean	4296	4306	2959	2886
Standard Deviation	±236	±179	±294	±264
Elongation†				
Maximum Value	710	720	700	700
Minimum Value	603	583	456	515
Range	107	137	244	185
Mean	663	679	614	618
Standard Deviation	± 26	± 41	± 58	± 47

* Modulus and tensile strength data are in pounds per square inch.
† Elongation is in per cent.

Usually the compounder will be most interested in the processing characteristics, the physical properties, and the curing rate of each lot of polymer as received. His

[1] Development Dept., Naugatuck Chemical Division, United States Rubber Co., Naugatuck, Conn.

interest in the chemical tests will be governed primarily by the effect their variation may have on the foregoing properties or performance in service.

Variability in Testing GR-S

This laboratory has made a study of the variability in testing GR-S tread type compounds in comparison with similar natural rubber compounds. The results given in Table 1 represent numerous tests on two, and only two, separate lots of natural and GR-S rubber, since the purpose of this investigation was primarily to determine variations between individual tests on given lots of rubber, particularly GR-S, rather than variations between a large number of lots of this synthetic rubber.

The standard deviations in the testing of natural rubber *vs.* GR-S may be averaged with the following result:

TABLE 2. STANDARD DEVIATIONS IN THE TESTING OF NATURAL RUBBER AND GR-S VULCANIZATES

Property	Natural Rubber	GR
Modulus	± 171 p.s.i.	± 173 p.s.i.
Tensile strength	± 207 p.s.i.	± 279 p.s.i.
Elongation at break	± 34 percentage points	± 52 percentage points

It is realized that some license has been taken in averaging the standard deviations observed for a 60-minute cure and a 50-minute cure on GR-S, but the error is slight and probably justified in order to determine an approximate over-all index indicating an order of magnitude. It is evident that the standard deviation in testing either material is of the same general order of magnitude although relative precision is seen to be somewhat less for GR-S.

The standard deviation is used here as a recognized mathematical estimate of the precision of measurement. Specifically for a series of tests involving the same compound, it defines the range on either side of the mean value within which two-thirds of the samples may be expected to fall. Practically it defines the density of clustering of the test values around a central mean. Thus the smaller the standard deviation the more dense the clustering and the greater the indicated precision.

When evaluating a new shipment of polymer against a standard sample of GR-S it is seen that the physical test values obtained from a single mixing may be expected to vary from the standard by several hundred pounds; yet the polymers might be identical although this might not be evident unless the average values from several mixes were obtained. The danger of making compounding, blending, or processing adjustments in the factory on the basis of tests obtained on a single mixing of a new shipment of polymer is apparent from a consideration of the foregoing data. At the present writing no practical solution to this problem has been fully developed, but it is believed the industry will be interested in perusing the results that have been obtained, and each plant will undoubtedly evolve its own technique for resolving this situation to their own production activities.

The foregoing data apply to compounds mixed on a standard six-by-12-inch laboratory mill, according to A. S. T. M. specifications. It is possible that variability of compounds mixed under other conditions might be less, as for example in a laboratory Banbury mixer. Some such procedure might be a partial answer to the problem.

It has been noted that the general level of any physical property in a single mixing tends to persist through a series of cures, which suggests that the variability applies to the mixing procedure as well as the actual testing. This might be checked by keeping on hand an appreciable amount of a blended polymer, of known performance, as a standard to be included in every evaluation series.

VARIABILITY IN TESTING MOONEY VISCOSITY OF GR-S. These data are for the 30 batches of Series #2 GR-S in the preceding tabulation. While only results for the compounded stocks are shown, the magnitude of the testing error is equally applicable to the uncompounded polymer. The results given are for a shearing time of 1½ minutes and were obtained before the present four-minute shearing time was specified. The variability observed may be summarized as follows:

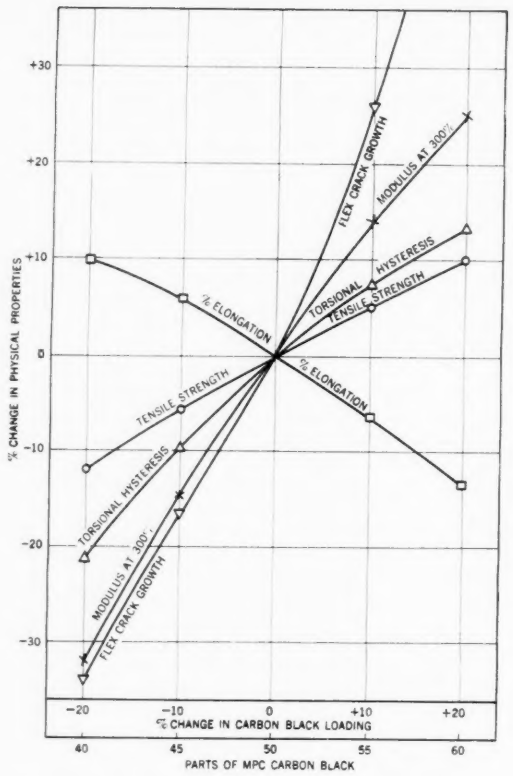

Fig. 1. Effect of Varying MPC Black on Physical Properties

TABLE 3. VARIABILITY IN TESTING MOONEY VISCOSITY OF GR-S

Compounded Mooney Viscosity—1½′—212° F.—1′ Warm Up

Minimum Value	Maximum Value	Range	Mean	Standard Deviation
69	90	21	79.36	±5.70
	Increase in Viscosity Upon Compounding			
−1	+20	21	6.96	±5.45

Possible Compounding Adjustments with GR-S

When it has been established beyond a reasonable doubt that real differences exist between two polymers, it may frequently be desirable to apply certain compounding adjustments in order to insure uniformity in factory processing and product performance. With this idea in mind the obvious compounding adjustments in the government test formula have been examined to determine their relative magnitude on properties of fundamental importance.

For convenience the exact testing formula used as a base is repeated:

TABLE 4. BASIC TESTING FORMULA

GR-S	100.0
Carbon black	50.0
Zinc oxide	5.0
Softener (coal-tar type)	5.0
M-B-T	1.5
Sulphur	2.0

Modulus was chosen as the most satisfactory criterion for judging uniformity of product and state of cure. Consequently polymers which come to equal modulus values in a given compound at the same curing time are considered identical for practical purposes.

Each of the ingredients in the above compound were varied in quantity upward and downward, and the effect on a series of physical properties was noted over a range of cures. The results obtained may be summarized briefly as follows:

Carbon Black. Although variation of carbon black content is a sensitive control, it is not recommended, except in extreme cases, as a compounding adjustment because of excessive concomitant changes in processing characteristics. This is particularly true of relative plasticity or shearing viscosity obtained in the adjusted compound resulting in profound changes in calendering and tubing characteristics. It has also been noted to exert a major effect on the relative degree of swell during extrusion in tubing machines. Thus if carbon black adjustment is used to smooth out differences in polymer, a series of processing adjustments will also be required including possible replacement of dies in tubing operations. The magnitude of the effect of varying medium processing channel carbon black content on physical properties is shown graphically in Figure 1.

Zinc Oxide. Our data indicate relatively slight changes resulting from variation in zinc oxide content, and this control is rejected because of a lack of sensitivity.

Softener. Variation in softener ratios is rejected for the same reasons considered objectionable in the use of carbon black as a control, i.e., although sensitive it produces too many changes in processing characteristics.

Sulphur and Accelerator. Variation in sulphur and accelerator contents have been found to exert major effects on curing rates and physical characteristics of the vulcanizate while at the same time producing only a minor effect on plasticity and processing characteristics. They are considered ideal therefore as a control, and their manipulation is discussed in the next paragraph.

The results which have been obtained in the standard test formula by varying the sulphur and accelerator M-B-T in the range of ± 33⅓ are summarized graphically in Figures 2 and 3. These data show that in general increasing the sulphur or accelerator has the effect of:

A. Increasing modulus at 300% and hence rate of cure.

B. Increasing flex crack growth.

C. Decreasing torsional hysteresis.

D. Decreasing elongation at break.

Conversely the above trends are seen to be reversed when sulphur or accelerator is decreased.

The data show improved tensile values for increasing sulphur ratios; whereas tensile strength is at a maximum for the 1.5 parts of M-B-T specified in the standard test formula and decreases when this amount is varied either way. There is some question as to whether the difference in behavior is real and would persist in the average taken from a series of several mixes; consequently the amount of significance to be ascribed to the difference in the tensile values reported will depend upon further investigation and the accumulation of additional data.

The trends noted for the other properties, however, have been confirmed consistently by this laboratory and are believed to be essentially correct. The three point curves are drawn with a certain degree of confidence because of this background, although when setting standards in individual test formulae, it is believed that additional points should be investigated and more exact relationship established over a closer range.

The increase in flex crack growth after aging 48 hours in air at 212° F. is also shown for variation in sulphur content because past work has shown this property to be very sensitive in this respect and one of the major limitations on the use of higher sulphur ratios.

A comparison of sulphur adjustment *vs.* accelerator

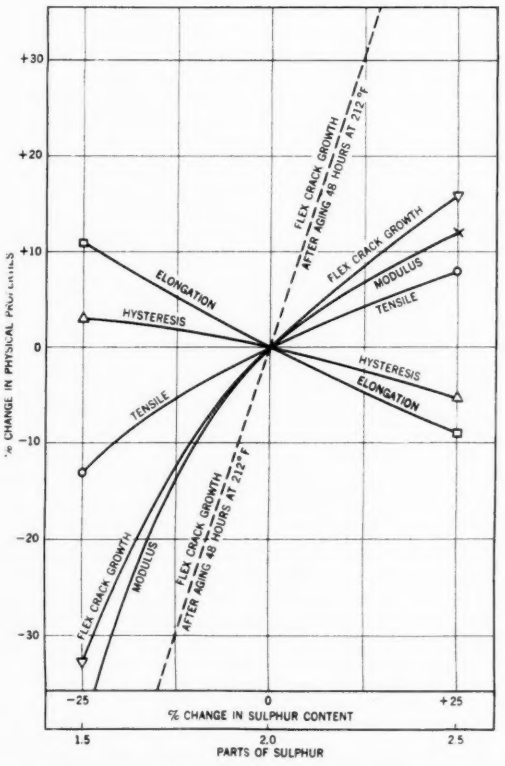

Fig. 2. Effect of Varying Sulphur Content on Physical Properties

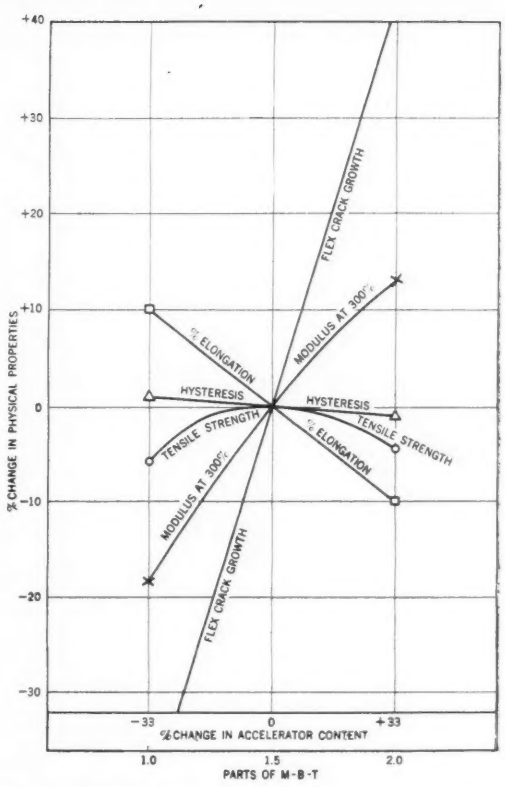

Fig. 3. Effect of Varying Accelerator Content on Physical Properties

adjustment in relation to the changes produced in other properties concomitant with a 10% change in modulus is set forth in the following table.

TABLE 5. SULPHUR VS. ACCELERATOR ADJUSTMENT

% Change in Properties Concomitant with 10% Change in Modulus

Compounding Variation	% Change in Properties				
	Modulus	Elongation	Torsional Hysteresis	Flex Crack Growth	
				Unaged	Aged
20% increase in sulphur	+10	−8	−4	+13	+48
24% increase in accelerator	+10	−8	−1	+29	....
10% decrease in sulphur	−10	+4	+2	−9	−24
19% decrease in accelerator	−10	+6	+1	−25	....

The present data show the advantages for choosing one control over the other to be relatively slight although more precise data with a larger number of smaller increments of sulphur or accelerator variations might indicate definite advantages. The possibility of using one control in preference to the other for specific objectives should not be overlooked in any ultimate evaluation in a specific compound.

Processing Adjustments

EFFECT OF HOT BREAKDOWN. It has been observed that hot breakdown of GR-S causes an increase in curing rate, and this factor must be taken into consideration when comparing laboratory mixings with factory mixings and in the selection of compounding adjustments to compensate for differences in the curing rate and or physical characteristics of polymers "as received."

The magnitude of this effect may be estimated from the following data which are reproduced for reference. These data were obtained in the standard government testing formula.

TABLE 6. EFFECT OF HOT BREAKDOWN ON THE CURING RATE OF GR-S

Property	Cure Minutes at 292° F.	Minutes Breakdown of Polymer on Mill at 250° F. Prior to Compounding			
		0	10	20	30
Modulus at 300% p.s.i.	45	810	930	820	1160
	60	820	1040	1020	1420
	75	900	1080	1030	1480
Tensile strength p.s.i.	45	3180	3120	2030	2060
	60	3170	3220	1990	2020
	75	3220	3040	2020	2140
Elongation at break %	45	630	626	486	413
	60	605	615	463	383
	75	596	556	475	395

It is evident from inspecting the moduli and elongation values that curing rates have increased progressively with hot breakdown of the raw polymer. Incidently, excessive hot breakdown has also caused a degradation in quality as evidenced by the lowered tensile values although we are not concerned with that phenomenon in the present analysis.

EFFECT OF GORDON PLASTICATION. A similar increase in curing rate has been noted for compounds formulated from polymer which has been broken down in a Gordon plasticator *vs.* polymer not so treated before compounding. The magnitude of this effect is indicated in the next table, which is also based on the standard test recipe.

TABLE 7. EFFECT OF GORDON PLASTICATION ON THE CURING RATE OF GR-S

Property	Cure Minutes at 292° F.	Treatment of Polymer Prior to Compounding	
		0 Passes Gordon Plasticator	3 Passes Gordon Plasticator
Modulus at 300% p.s.i.	15	170	200
	30	450	475
	60	800	980
	90	1000	1140
	120	1185	1210
Tensile strength p.s.i.	15	900	860
	30	2100	2280
	60	2900	3020
	90	3180	2980
	120	3000	2800
% Elongation	15	846	780
	30	736	706
	60	616	620
	90	596	543
	120	556	493

Although specific data are not available, reports from plants operating Gordon plasticators state that the largest increment in increased curing rate occurs with the first pass; the relative increase becomes progressively smaller with successive passes.

As stated before, these data are reproduced here to direct attention to one of the limitations on translating laboratory results to factory practice and to emphasize the necessity of giving polymers identical treatments when comparing them for curing rates and quality levels.

The effect of hot breakdown or Gordon plastication also presents some possibilities for use as a control in smoothing out differences between polymer shipments. The utilization of this principle obviously requires careful calibration on specific compounds processed on specific factory equipment.

In conclusion it may be stated that many factories are planning to carry out extensive blending operations of polymers from different sources, whenever possible, rather than resorting to elaborate compounding adjustments such as have been examined in the foregoing pages.

Mooney Viscometer Adopted for GR-S Control

WHEN the government program for making synthetic rubber was evolving, inevitably arose the difficult problem of producing a uniform quality of GR-S in several different plants scattered over the continent. Among the important properties requiring control was the mean molecular weight of the polymer, which largely determines processing behavior. The determination of molecular weight by either the cryoscopic or the viscometric method is too slow for satisfactory use in routine control. An alternative property for control testing is the plasticity of the polymer, for the plasticity is closely related to the processing quality and to the mean molecular weight. Any of the different plastometers developed for testing rubber could doubtless be used.

After due consideration the shearing disk plastometer, or "Mooney viscometer", was adopted as the standard instrument for measuring the viscosity (or "plasticity") of GR-S manufactured under government supervision, and Naugatuck Chemical Division, United States Rubber Co., undertook to provide the first instruments required. In this instrument the sample under test is sheared continuously between a disk-shaped rotor and a hollow cup-shaped stator; the clearance between the rotor and the top or bottom of the stator is $\frac{1}{10}$-inch. The viscous resistance of the sample to the shearing action is caused to deflect a spring, and the deflection is read on a dial gage. This reading, usually called Mooney viscosity, is the average viscosity in arbitrary units over the range of shearing rate from zero, at the center of the disk, to the maximum rate, at the periphery.

The Mooney viscometer was developed by U. S. Rubber some ten years ago. The first dozen instruments were manufactured for the company's various plants. After a

(Continued on page 44)

Evaluating Low-Temperature Stiffness and Brittle Point in Elastomers

Floyd L. Graves[1] and Arnold R. Davis[1]

SOFT vulcanized natural rubber has the unique property of maintaining excellent flexibility over a wide range of temperatures. This quality has made this material particularly useful in the automotive and aeronautical fields.

Most of the synthetic elastomers in use today are more sensitive to temperature change than is the natural product; accordingly new problems have arisen in compounding for low-temperature service. The various types of elastomers differ in their inherent resistance to stiffening with cold, and the compounding of each type can greatly influence this resistance.

To meet the challenge of these problems laboratory methods for evaluating low temperature behavior have been set up by many workers. Numerous devices and methods have been developed, and in general each approach to the study has been the outgrowth of problems in the particular field of the investigator. It is the intention to summarize here, very briefly, some of the more recent work and to present the methods of evaluation employed in these laboratories.[1]

Test methods for evaluating low-temperature behavior can be divided into two general classifications. In the first are brittle point tests, designed to determine the temperature at which an elastomer has lost its flexibility to the extent that it fractures when subjected to deformation. In the second classification are the low-temperature stiffness tests, designed to measure the degree of stiffening that develops in elastomers with drop in temperature and so provide data at temperatures above their brittle points.

The test method most applicable to a given low-temperature problem is, of course, predicated on the demands to be made upon the compound in service. For example, insulated wire for use in high-altitude aircraft must withstand manipulation at very low temperatures. In such an application the insulating compound must be designed to resist cracking; consequently a test to study brittle point would be indicated. If, however, the function of the elastomer is one of intermittent flexing, as in pump diaphragms, or in deicing boots for airplane wings, it becomes important to design a compound which will undergo a minimum of stiffening over the average range of operating temperatures. For this type of study a test of the second classification, a low-temperature stiffness test, is required.

The importance of these two distinct approaches to low-temperature behavior becomes more apparent when it is realized that a compound which has a satisfactorily low brittle point for a given job may not provide a sufficiently low degree of stiffening with drop in temperature, to give the desired flexibility in service.

In the following discussion brittle point testing and low temperature stiffness testing will be considered independently since methods for each approach have been set up in these laboratories.

Summary of Recent Brittle Point Testing

Kohman and Peek[2] described a method whereby a strip of rubber was bent through an arc of 90 degrees by a hammer blow instantly upon removal from a refrigerated alcohol bath. They found that if a high rate of deformation was employed, consistent brittle point data could be obtained which were nearly independent of sample dimensions. The variations in thickness of the samples they tested were in the same order as found in the usual run of laboratory test sheets.

I. G. Farbenindustrie[3] recommended a method in which six samples were tested at one time. Specimens measuring 15 by 60 by 0.5 millimeters were bent double, forming loops, and fastened on a block over which a falling weight was secured. The apparatus was installed in a cooling cabinet in which temperature control was achieved by blowing air across dry ice. After a suitable conditioning period the weight was allowed to fall on the looped specimens and the temperature noted at which fracturing occurred.

Recently Kemp, Malm, and Winspear[4] expanded their commendable work on brittle point testing. They found that the sharply defined brittle point observed when a specimen is bent at high speed through an angle of 90 degrees is lowered when the speed of application or the magnitude of stress is reduced. Their work was carried out using a motor-driven bending device immersed in an acetone bath cooled with dry ice.

Subcommittee V of SAE-ASTM Technical Committee A on Automotive Rubber has recommended the use of a modification of the freeze test of the Thiokol Corp.[5] This test has been incorporated into a number of recent Aeronautical Material Standards Specifications. The device consists of two parallel plates mounted horizontally, one 2½ inches above the other. The lower plate is stationary while the upper plate may be raised and lowered by a hand-operated crank. Test pieces four inches by 0.25-inch by 0.06-inch are mounted between the plates in loop fashion so that when the upper plate is lowered, the specimens are bent between the faces of the plates. By changing the stroke of the upper plate, the radius of bending can be varied. A half revolution of the crank produces maximum bending; while full revolutions will flex the piece. The apparatus operates in a cold air cabinet; the cranking mechanism is outside the conditioning chamber. The device is simple and flexible in use, but does depart somewhat from the precision that most recent workers have been endeavoring to bring into low-temperature evaluation.

American Cyanamid Brittle Point Method

The brittle point tester used in these laboratories has been constructed to bring into one instrument what we have felt to be the salient features of other apparatus developed for this work. Test specimens are 1½-inch strips cut in the mill (grain) direction from regular ASTM test sheets ranging in thickness from 0.070 to 0.085-inch. The standard T-50 test die is a convenient tool for cutting test

[1] Stamford, Conn., research laboratories, American Cyanamid Co., 30 Rockefeller Plaza, New York, N. Y.

[2] *Ind. Eng. Chem.*, 20, 81 (1928).

[3] *Kunststoffe*, 28, 171 (1938).

[4] *Ind. Eng. Chem.*, 35, 488 (1943).

[5] INDIA RUBBER WORLD, 107, 392 (1943).

pieces and provides strips 0.10-inch wide. The apparatus has been built to test from six to twelve specimens at one time, depending upon the impact strength of the materials in the brittle state.

A bath of denatured alcohol (2B) cooled with dry ice is used for conditioning the samples. This bath has minimum solvent action on natural and synthetic elastomers and provides a more sensitive as well as a faster method of conditioning than is possible with air cooling.

The test pieces are bent mechanically through an arc of 90 degrees at a reproducible high rate of deformation. Brittle points determined in this way represent the highest temperature at which fracturing of the elastomer may be expected.

A conditioning period of five minutes has proved sufficiently long to produce a brittle state at the critical temperature in natural and the synthetic rubbers tested. In working with new elastomers, however, the effect of time of exposure to cold on the development of brittleness would require investigation.

Apparatus. A copper tank 5½ by 11 inches is encased in ¾-inch plywood; the latter provides a good degree of insulation for the bath as well as serving structurally. All mechanical parts are of stainless steel or aluminum to eliminate rusting. Figure 1 shows the tank with test pieces (*T*) mounted in the clamp type holder (*H*). By turning knob (*K*) counter-clockwise, the holder is lowered into the alcohol bath, bringing the test strips into a horizontal plane. In the foreground is the bending mechanism consisting of a plunger (*P*) actuated by four springs (*S*). The plunger is "set" by gripping the supporting bar at (*a*) and (*b*) and pressing down on a solid flat surface with sufficient force to stretch the springs ⅝-inch when a spring locking lever (*L*) secures the plunger. In this position the springs are at a total tension of between 95 and 100 pounds. The wire basket (*B*) serves as holder for the dry ice and is readily lowered into and removed from the bath to provide temperature control to within ± .5° C. during the conditioning period. A mechanical stirrer (*M*) assures uniform bath temperature throughout the test.

The assembled apparatus is shown in Figure 2. The test pieces have been lowered into position, and the plunger has been set and clamped securely into place with wing nuts. In this set up the foot of the plunger is just above the surface of the horizontal test pieces and is ¼-inch out from the jaws of the holder. Moving lever (*L*) releases the plunger which travels down in a vertical plane a distance of ⅝-inch, sufficient to bend the test pieces through an arc of 90 degrees.

Testing Procedure. The tank is filled with 2B alcohol to a depth of about 3½ inches. Test pieces, in duplicate, are clamped in the holder in convenient order for identification with about ¾-inch extending. Dry ice is added to the bath, with stirrer running, until the temperature is about 2° C. above the highest anticipated for the series of materials to be evaluated. The holder is then lowered into the bath, and the plunger set in place as in Figure 2. A suitable thermometer is inserted through the side of the tank. Additional dry ice is added, using the wire basket, to bring the temperature down to that desired for the first test. After five minutes' conditioning at the test temperature, ±0.5° C., the plunger is released by lever (*L*). The thermometer and plunger mechanism are then removed, and the test pieces raised out of the bath by knob (*K*) and examined for cracking. Fresh samples of those that have not failed are clamped in place and the procedure is then repeated at a lower temperature. In our work we usually determine brittle point to the nearest 1° C.

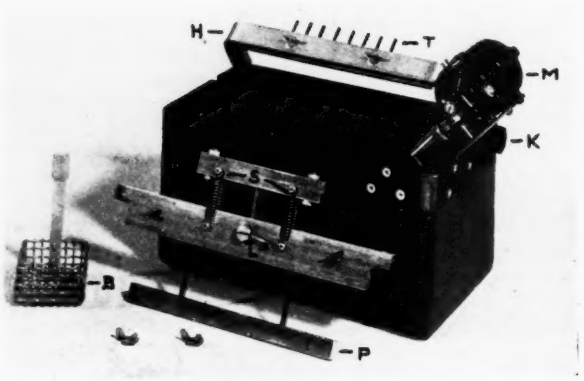

Fig. 1. Apparatus Used for Brittle Point Test

Typical brittle point data obtained with this instrument are given in Table 2 on four elastomers compounded as indicated in Table 1.

Table 1. Compound Formulae

	Test Stock No.						
	1	2	3	4	5	6	7
Natural Rubber	100						
GR-S		100					
Perbunan			100	100	100		
Hycar OR-15						100	100
Channel black	50	50	50	50	50	50	50
Zinc oxide	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Stearic acid	1.0		1.0	1.0	1.0	1.0	1.0
Sulphur	3.0	2.0	2.0	2.0	2.0	1.25	1.25
AgeRite Powder	2.0						
M. B. T.	1.0	1.5					
Altax			1.0	1.0	1.0	.80	.80
Aero Ac 50						.15	.15
Coal-tar softener	5.0	5.0					
Plasticizer A				30		30	
Plasticizer B					30		30
Cure tested—Min.	30	60	30	30	30	30	30
°C.	141	141	141	141	141	153	153

Table 2. Brittle Point Temperatures

Elastomer	No.	Plasticizer	Brittle Temp. °C
Natural Rubber	1	5% Coal-tar softener	−58
GR-S (butadiene-styrene)	2	5% Coal-tar softener	−69
Perbunan (butadiene acrylonitrile)	3	None	−50
Perbunan (butadiene acrylonitrile)	4	30% Plasticizer A	−52
Perbunan (butadiene acrylonitrile)	5	30% Plasticizer B	−62
Hycar OR-15 (butadiene acrylonitrile)	6	30% Plasticizer A	−39
Hycar OR-15 (butadiene acrylonitrile)	7	30% Plasticizer B	−49

Summary on Low Temperature Stiffness Testing

While brittle point tests indicate satisfactorily the temperature at which flexibility ceases to exist, they do not provide an insight into the gradual loss of this flexibility with temperature drop. The need of measuring the effect of temperature on the flexibility of elastomers has been recognized by many workers. Justice could not possibly be

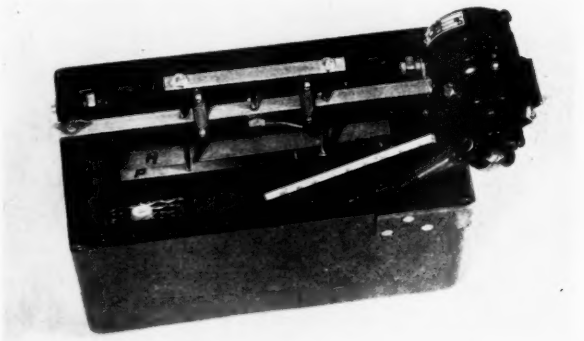

Fig. 2. Assembled Brittle Point Apparatus

done in this short paper to the comprehensive work that has been done by others on this problem. The methods of a few, however, can be mentioned briefly, and our own procedure offered for consideration.

McCortney and Hendrick,[6] in developing an activating mechanism and diaphragm to be used in Chrysler automatic transmissions, experimented with several tests for comparing the cold resistance of synthetic rubbers. They tried the standard T-50 test and changes in Durometer hardness as a means of determining resistance to cold, but found the results unsatisfactory. A modified T-50 test was then tried in which standard tensile testing dumbbells were stretched to 200% elongation and placed in a room at —40° C. Upon conditioning, the test pieces were released, and after 30 seconds the elongation that remained was recorded. The amount the dumbbells failed to return was taken as a measure of low-temperature stiffness. This test also failed to evaluate the qualities desired. After further work McCortney and Hendrick found it necessary to test the diaphragms themselves in the activating mechanism. The test they devised recorded cold resistance in terms of the vacuum, in millimeters of mercury, required

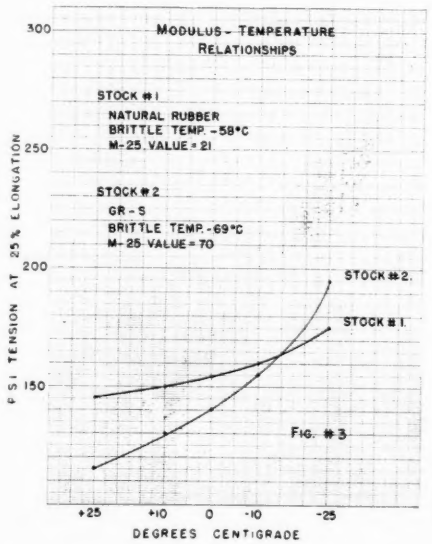

Fig. 3. Modulus-Temperature Curves for Natural and GR-3 Rubbers

Fig. 4. Adapter for Low-Temperature Stiffness Testing

to reverse completely the rubber diaphragm. Fortunately in this instance, in the absence of a suitable laboratory test, the mechanism itself was found to be of value in development work.

Clash and Berg[7] developed a low-temperature flexibility test in which the test specimen was subjected to controlled torsional forces. The apparatus was used in their work on the low-temperature behavior of vinyl elastomers. The device employed a rectangular test specimen mounted with the lower end clamped rigidly while the upper end was attached to the shaft of a horizontal pulley to which controlled torque could be applied. The system was set up in a Dewar flask filled with alcohol to a level above the test specimen. The bath was refrigerated with dry ice. In this test method the specimen was subjected to torsional deformation by a constant load at various temperatures. Data on change in flexibility with temperature drop were derived from the angular twist of the test piece as observed on the torque head, which was calibrated in degrees of arc.

Koch[8] developed a method employing measurements of bending stress. In his device the foot of a micrometer was placed on the center of a small bar test piece, the ends of which were supported. The set up was mounted in a large test tube, which in turn was immersed in a Dewar flask containing acetone with dry ice as refrigerant. The test piece was first frozen to a rigid state, then allowed to warm up with the micrometer foot in place under a constant load. As flexibility began to return, the deflection on the micrometer dial was observed. With this device distortion-temperature curves could be developed and elastic modulus calculated.

American Cyanamid Low-Temperature Stiffness Method

The test developed in these laboratories employs tensional forces in a convenient method for low-temperature stiffness comparisons. In all flexing applications elastomers are subjected to stresses of tension, compression, and shear, producing from minute to very appreciable degrees of deformation. Since in most materials moduli in compression and shear are closely related to those in tension, an index of the latter should serve to evaluate the behavior under the complex combination of stresses which occur in flexing.

In rubber terminology the modulus of a compound is the tension, in pounds per square inch original cross-sectional area, required to produce a specified elongation in per cent. It is, however, usually expressed in pounds per square inch at a particular elongation. Modulus data are commonly used by rubber technologists as indicative of stiffness in rubber compounds.

From the above it becomes apparent that in studying the effect of temperature drop on the modulus of elastomers we are not only basing our evaluation on a typical kind of deformation present in flexing, but are also presenting our data in terms at once familiar to rubber technologists.

Our use of stress-temperature data represents a new technique rather than an original approach to the problem. Russell[9] determined stress-temperature relations at 112.5% elongation on polyvinyl chloride compositions as a method for comparing plasticizers for low-temperature service.

In the test to be described the modulus at 25% elongation is obtained at —25° C and at —25° C. The percentage increase in modulus, with this drop in temperature, is calculated and recorded as the M-25 value for the material tested. The test is carried out on a conventional Scott rubber tensile machine which may be readily adapted for this work.

The elongation of 25% was selected arbitrarily. In most flexing applications the elongations encountered would be of a low order, and it was felt that 25% was as low as could be conveniently observed on the tensile machine. The temperatures, +25° C. and —25° C., were also chosen arbitrarily in order to set up a standard test by which many compounds could be evaluated over an average range of operating temperatures. Actually the test is quite flexible. When adapted to a specific problem, compounds could be compared over a range of temperatures and at an elongation more closely simulating the conditions to be met in service.

In addition to determining the M-25 value in evaluating elastomers, it may be occasionally of interest to take time to determine additional modulus data at intermediate temperatures, and in this way develop modulus-temperature curves. Figure 3 illustrates typical curves prepared from the natural rubber and GR-S stocks described in Table 1.

[6] Ind. Eng. Chem., 33, 579 (1941).
[7] *Ibid.*, 34, 1218 (1942).
[8] *Rubb. Chem. Tech.*, 14, 799 (1941).
[9] *Ind. Eng. Chem.*, 32, 509 (1940).

APPARATUS. Tests are run on the Scott rubber tensile machine fitted with a driving pulley to provide a rate of pull of 12 inches per minute. The 50-pound testing range is used for all but extremely stiff stocks.

The adaptor for low temperature testing, shown in Figure 4, is mounted on the driven shaft of the Scott (*D*). A bar of flat steel one inch by ¼-inch is used as the supporting member (*S*) for a Dewar flask (*F*), containing 2B alcohol, as well as serving as the lower grip for the test piece at (*L*). The upper end of the test piece is mounted at (*U*) on the shaft (*R*) which connects to the recording dial. The thumb screws shown at (*U*) and (*L*) mount the piece securely and do not cause tearing at the low elongation employed in the test. The thermometer, stirring device, and rule for following the elongation, have been omitted from the photograph for clarity.

A six-inch dumbbell test piece is used having a test section ½-inch wide. Holes for mounting the test piece are punched in the tab ends 4½ inches apart.

TESTING PROCEDURE. Specimens are cut in the mill (grain) direction from regular ASTM test sheets, and thickness readings made in the usual manner for tensile testing. A two-inch bench mark is placed near the middle of the test piece, and it is then mounted for testing. The alcohol bath, at +25° C., is slid up into position on a clip provided for its support at (*C*). A rubber bumper (*B*) holds the flask in position. A stainless steel rule is placed in the bath to follow the elongation as indicated by the bench mark. The test piece, having never been stretched before, is given a preliminary stretch to 50% elongation, after which it is allowed to condition for five minutes at +25° C. At the end of this period the tester is started, and the elongation is followed carefully. At 25% elongation the tension is recorded by the sparking device on the chart of the Scott, and the tester immediately reversed.

After all test pieces in the series have been tested in this manner at +25° C., the bath is cooled with dry ice to —25° C. Beginning with the first dumbbell tested, the procedure is repeated, taking care that the bath is stirred and held at —25° C. ± .5° C.

The M-25 value or per cent. increase in stiffness with temperature drop from +25° C. to —25° C. is calculated:

$$\text{M-25} = \frac{M_2 - M_1}{M_1} \times 100 \qquad \text{where}$$

M_1 is the modulus in pounds per square inch (psi.) determined at +25° C., and M_2 is the modulus in psi. determined at —25° C.

Low temperature stiffness data on the compounds described earlier are given in Table 3 along with brittle points.

TABLE 3. LOW TEMPERATURE STIFFNESS AND BRITTLE POINT RESULTS

Elastomer	Plasticizer	Psi. Modulus at 25% Elongation		Psi. Increase	M-25 Value	Brittle Temp. °C.
		+25° C.	—25° C.			
Natural Rubber	5% Coal-tar softener	145	175	30	21	—58
GR-S	5% Coal-tar softener	115*	195	80	70	—69
Perbunan	None	230	1760	1530	665	—50
Perbunan	30% Plasticizer A	90	170	80	89	—52
Perbunan	30% Plasticizer B	90	135	45	50	—62
Hycar OR-15	30% Plasticizer A	90	670	580	645	—39
Hycar OR-15	30% Plasticizer B	85	220	135	159	—49

Discussion of Results

The comparative data in Table 3 illustrate the value of employing both brittle point and low-temperature stiffness measurements for more complete evaluation of the cold resistance of elastomers. It is interesting to note that natural rubber having a brittle point 11° higher than GR-S has an M-25 value of only 21 compared to 70 for the latter compound.

While Perbunan, in the unplasticized state, would never be considered for low-temperature service, it has been included here as an illustration of a material which has a low brittle point, yet would not have sufficient flexibility to be useful in a flexing application at low temperatures. The addition of 30% Plasticizer A, however, has a profound effect on low-temperature stiffness, while depressing the brittle point only 2° C. The effect of Plasticizer B is even more marked than that of Plasticizer A, in Perbunan, since it improves brittle point as well as low-temperature stiffness. Again in Hycar OR, Plasticizer B is outstanding in improving an elastomer which stiffens more than Perbunan in the unplasticized state.

Conclusions

The above illustrations indicate some of the possibilities in our method of evaluation. The urgency of the times requires that all workers come forward with any new test methods that may be of value in developing better compounds, without consuming valuable time investigating all of the possibilities and limitations of such methods.

Possibly other workers will wish to apply the test methods described, in their studies on the effects of plasticizers, curing times and temperatures, reenforcing fillers, etc., in low-temperature compounding of the various new elastomers being pressed into service today.

We wish to thank R. Bowling Barnes and L. Boor for their suggestions and active interest in the development of these tests.

Mooney Viscometer

(*Continued from page 40*)

few years of service the instruments attracted general interest, and the company sold Mooney viscometers to many other rubber firms at home and abroad.

The demand for the Mooney viscometer was considerably increased when it was adopted for the government synthetic rubber program. In consequence, manufacture and sale of the instrument has now been turned over to Henry L. Scott Co., manufacturer of testing apparatus for the rubber and textile industries, Providence, R. I. Besides selling new plastometers, Scott will carry in stock replacement parts for plastometers already built and in service.

The United States Bureau of Standards is cooperating in further developing the Mooney viscometer to give additional precision. Without making any alterations in the main features, changes in design will be tried to reduce the error of the readings. The changes are such that, if successful, they can easily be incorporated in the viscometers already built.

Native Sulphur, January—July 1943

During January—June, native sulphur production was below the apparent volume of sales, and producers' stocks were reduced 230,321 long tons, according to the Bureau of Mines. The rate of depletion is not alarming as the reduction totaled only 4% of the 5,148,206 long tons on hand January 1, 1943. Compared with the first half last year, production and mine shipments were 25 and 18% lower, respectively, but apparent sales were down only 2%.

Production in July was 188,913 tons, the lowest since compilation of monthly figures began by the Bureau in August, 1940. The previous low was in February, 1943, 200,802 tons. Monthly consumption, as indicated by apparent sales, has continued to increase moderately since December, 1942; but July consumption was 6% below that of July, 1942. Compared with June, 1943, July production dropped 14% and producers' stocks 2%; whereas mine shipments increased 13%.

Recent Russian Literature on Natural and Synthetic Rubber—IV

M. Hoseh

THE Mechanism of the Action of Mercaptobenzothiazole Derivatives as Vulcanization Accelerators. II. The Transformation of Mercaptobenzothiazole Sulphide.[1] O. A. Zeide and K. D. Petrov, *Kauchuk i Rezina*, 2, 53-56 (1937). **M-5.**

In the process of vulcanization mercaptobenzothiazole sulphide is transformed into mercaptobenzothiazole and its Zn salt. First the sulphide reacts with S giving unstable addition products. Upon heating, the addition products are converted to dibenzothiazole disulphide; then the disulphide is transformed to mercaptobenzothiazole and its Zn salt. The action of mercaptobenzothiazole sulphide as accelerator is attributed to the formation of these two products.

The Physical Chemistry of Surface Phenomena in Rubber Technology. IX.[2] The Effect of Nitrogenous, Surface Active Substances on the Mechanical Properties of Toluene Sols of Sovprene. V. B. Margaritov, *Kauchuk i Rezina*, 5, 3-5 (1937). **S-19.**

A peptizer for Sovprene should be distinguished by ability to (1) peptize Sovprene and (2) alter the molecular properties of Sovprene in a manner that it would become completely miscible with SK. The most desirable surface active substances for this purpose are those which increase the mechanical strength of the other component, e.g., SK-B, and at the same time would equalize the properties of the two components, Sovprene and SK-B. The effect of a number of compounds on Sovprene was tried. These compounds were: chrysoidine, paratoner, triethylamine, Fatty Orange D, heptylamine, *p*-phenylenediamine, pyridine, quinoline, parared, K-30, and K-25 (both accelerators), aniline, and naphthylamine. These substances were added to 3% toluene sols of Sovprene, and their effect was determined with an Ubbelohde viscosimeter. The following conclusions are drawn from the experimental results: (1) For complete mixing of SK-B and Sovprene the polarities of the two should be equalized. (2) Of the tested substances the most effective peptizers for Sovprene are Schiff condensation products K-30 and K-25. (3) Azo dyes of the naphthylamine type are very effective in lowering the "harshness" of Sovprene. For best results the peptizers should be added as solutions in benzene, alcohol, or other volatile solvents.

The Physical Chemistry of Surface Phenomena in Rubber Techology. X.[1] The Effect of Vulcanization Accelerators on the Physico-Chemical Properties of Rubber Sols and Gels. Y. Margolina, *Kauchuk i Rezina*, 7/8, 27-34 (1937). **SN-5.**

A number of accelerators were tested for their effect on: (1) stabilization of a suspension of ZnO in benzene; (2) rubber sols in the first stages of vulcanization, and (3) swelling and colloidal dissolution of vulcanized rubber in kerosene. The substances tested were: diphenylguanidine (I), dimethyldithiocarbamate (II), diethyldithiocarbamate (III), piperidine pentamethylenedithiocarbamate (Vulcacite P) (IV), tetramethylthiuram disulphide (V), tetraethylthiuram disulphide (VI), a condensation product of butylaldehyde and *p*-aminodimethylaniline (VII), a condensation product of aniline and *p*-toluidine (VIII), a condensation product of acetaldehyde and aniline (IX), thiocarbanilide (X), stearic acid (XI), and freshly prepared aniline (XII).

With respect to their stabilizing effect on ZnO these compounds can be arranged in the same order as to their effectiveness as vulcanization activators. Each of these substances can be characterized by two values: C_m—the concentration (%) of the substance which gives maximum stabilization and the coefficient of stabilization $\beta = \frac{V_o}{V_{min}}$ which shows how much slower does the suspension settle out under the influence of the stabilizer than without it. In this equation V_o is the settling velocity of the suspended material, and V_{min} is the settling velocity in the presence of a stabilizer. The values of β and of C_m for the above substances are, respectively: (I) 4.2, 0.2; (II) 3.6, 0.16; (III) 3.3, 0.16; (IV) 3.6, 0.2; (V) 2.3, 06; (VI) 1.8, 0.1; (VII) 6.6, 0.4; (VIII) 6.6, 2.0; (IX) 4.0, 1.2; (X) 1.6, 0.16; (XI) 80, 0.08; (XII) 3.2, 26. The unique position of stearic acid is apparent at a concentration (optimum) of 0.08%, its coefficient of stabilization is 80. Diphenylguanidine, although only medium effective as an accelerator, proves a strong stabilizer.

Vulcanization of rubber is accompanied by a sol→gel transformation. A lyogel is formed which is a structural complex of rubber micelles solvated to saturation. The addition of strong accelerators to NK sols causes at first a strong peptization accompanied by a lowered viscosity. The peptization increases the total effective surface area at which rubber micelles and the solvating medium interact. Thus it is of paramount importance for gel formation. Accelerators of the dithiocarbamate type are strong peptizers for NK. SK is only slightly peptized by these compounds.

Vulcanized NK containing no accelerators swells and dissolves colloidally in kerosene. The presence of accelerators makes them more stable in and resistant to kerosene. Most effective in this respect is (IV) and (IX), least effective is (I). For vulcanized SK the same arrangement holds true, but the effect of these substances is less pronounced.

Determination of Alkalinity in SK-B. I. Taranenko, *Kauchuk i Rezina*, 9, 27-31 (1937). **S-20.**

A new method for determining alkalinity in SK-B is given which the author claims is preferable to the old method. Its outline follows: Place two to three grams of rolled and finely cut SK in a porcelain or platinum crucible and cover. Put the crucible into a hole cut in a sheet of asbestos and ignite over a burner or in a muffle at 300-400° C. First ignite until the resins and the tars volatilize; then raise the temperature to 700-800° C. and ignite to white ash. The second step can be accelerated by add-

[1] Part I was published in *Zhurnal Rezinovoi Promyshlennosti*, 7, 665 (1935).
[2] For reference to other papers in this series, see INDIA RUBBER WORLD, Sept. 1943, p. 559.

ing a little H_2O_2 or EtOH. During the ignition the following reaction takes place: $CaCO_3 \rightarrow CaO + CO_2$ and $2\ NaOH + CO_2 \rightarrow Na_2CO_3 + H_2O$. Thus the ashes consist of CaO and Na_2CO_3. Treat the ashes with $(NH_4)_2CO_3$. This transforms CaO into $CaCO_3$ and fixes any remaining NaOH according to $CaO + (NH_4)_2CO_3 \rightarrow CaCO_3 + 2\ NH_3 + H_2O$ and $2\ NaOH + (NH_4)_2CO_3 \rightarrow Na_2CO_3 + 2\ NH_3 + H_2O$. Heat the sample at 150-200° C. to drive off NH_3 and any excess of $(NH_4)_2CO_3$. Weigh the residue ($CaCO_3 + Na_2CO_3$), thus determining the ash content. Transfer the ashes into an Erlenmeyer (250 c.c.) and rinse the crucible. Use hot water for both. Add a saturated solution of NaCl, a few drops of phenolphthalein and without filtering, titrate with 0.1 *N* HCl. At the equivalent point only one half of the Na_2CO_3 is titrated and none of the $CaCO_3$. Calculate alkalinity by the formula: $\frac{2 \times V \times 0.0053 \times 100}{\text{wt. of sample}} = \%\ Na_2CO_3$, where V is the volume of 0.1 *N* HCl used in titration. This method is preferable to the methyl orange titration because it prevents the error of titrating some $CaCO_3$ which is always found in the filtrate. The usual correction made for this is not reliable, as the amount of $CaCO_3$ dissolved is not known. Further this method does away with the necessity of filtering and washing the precipitate. It also enables determining simultaneously the ash content and the alkalinity, and saves reagents (HCl) and filter paper. Time for the analysis is one hour and 20 minutes to one hour and 30 minutes. When many analyses are made, the time is reduced 40-50 minutes.

On the Use of Gutta Percha in Ebonite. V. Kashin, *Kauchuk i Rezina*, 10, 20-27 (1937). **SN-6.**

Experiments were conducted on the use of gutta percha in compounding ebonite in order to improve some of the properties of ebonite compounded from SK, especially the ones which make ebonite from SK inferior to ebonite compounded from NK (natural rubber). Four compounds were used in the experiments varying in the relative amounts of SK and gutta percha:

	I	II	III	IV
SK-B	100	72	50	0
Gutta percha	0	28	50	100

The experiments were run in two series which differed in the nature of the SK used. In series A was used an SK having an alkalinity of 1.37% and a plasticity of 0.31. For series B was used an SK with an alkalinity of 1.17%, an ash content of 3.03%, and a plasticity 0.35. The results presented in tables and graphs show that the process of fixing S is much slower by gutta percha alone than it is by SK or NK. The nature of fixing S by a SK-gutta percha mixture is approximately the same as by SK alone, but quite different from by gutta percha alone. The electric surface discharge, both at room conditions (50-60% humidity) and in humid conditions (95-98% humidity), does not differ from ebonites made from SK, NK, and SK-gutta percha mixtures. As the amount of gutta percha in the mix increases, the dielectric strength of the ebonite increases. The increase is greater at 20° C. than at 70° C. The dielectric strength of ebonite made of gutta percha alone is approximately twice as great as of ebonite made from SK with an alkalinity of 1-1.5% alone. The resistance to tear, break, and impact of ebonite made from 1:1 gutta percha and SK is greater than of ebonite compounded from either alone. The hardness of 1:1 ebonite is greater than that of either SK or NK ebonite. The heat resistance is higher in ebonite made of SK alone than that made of gutta percha alone. Products made of SK-gutta percha mixtures occupy an intermediate position; the heat resistance decreases as the amount of gutta percha increases. The addition of gutta percha to the mix lowers appreciably the swelling of ebonite in benzene, water, and oil. The lowering is most intense when the amount of gutta percha is raised to 50%. Adding of gutta percha increases the adhesiveness of the crude mix, thus facilitating mastication, calendering, and pressing; furthermore the surface of the pressed product is greatly improved. One of the drawbacks of adding gutta percha is increased shrinkage during vulcanization as compared to the shrinkage of SK alone. In turning (on a lathe), a 1:1 mixture behaves worse than NK ebonite, but much better than SK ebonite. The 1:1 ebonite can be machined (drilled, punched) better than SK and even NK ebonite. Finally, ebonite compounded from SK and gutta percha looks no different from ebonite made from NK or SK.

The Physical Chemistry of Surface Phenomena in Rubber Technology. XI.[1] The Effect of Phenylhydrazine on the Structural Properties of Sodium Butadiene Rubber. Y. Margolina, *Kauchuk i Rezina*, 10, 27-32 (1937). **S-21.**

The effect of phenylhydrazine [$C_6H_5NHNH_2$] on the plasticity of SK, on the viscosity of its sols, and on the strength of sheets (0.2-mm. thick) made from it, were investigated. The addition of phenylhydrazine to SK followed by a thermal treatment lowers the plasticity. The degree of this lowering depends on the amount of hydrazine added and on the time of the thermal treatment. The plasticity decreases as either or both of these increase. Plastification (on rolls) of heat treated SK containing phenylhydrazine raises the plasticity more than it does in the untreated material. After a few hours, however, the plasticity returns to its initial value.

The effect on viscosity depends on the amount and the way phenylhydrazine is added. When it was added to a 10% solution of SK in xylene and the solution was then heated for 2.5 hours at 110° C., the viscosity of the solution decreased. If phenylhydrazine is added directly to SK on rolls, the viscosity of solutions made from this SK depends on their thermal treatment. When the specimens are not subjected to a thermal treatment, the viscosity drops somewhat. However when SK to which phenylhydrazine was added on rolls is heated for 2.5 hours at 110° C., the viscosity changes considerably. Thus processed, the SK does not dissolve in the usual solvents and only swells in them. However if this SK is plasticized for several minutes on cold rolls, it dissolves completely. The rate of dissolution and the viscosity of the resulting solutions depends on the time of plastification. The viscosity of these solutions also depends on the amount of phenylhydrazine which they contain. It reaches a maximum with two parts by weight to 100 parts of SK, and then declines again.

Phenylhydrazine also increases the strength of SK as compared to SK not containing it. It was also observed that the addition to SK of 1, 2-diphenylhydrazine [$C_6H_5NHNHC_6H_5$], a substance closely resembling phenylhydrazine, but having a symmetrical molecule, causes no change in the plasticity, viscosity, or strength of SK. The changes caused by phenylhydrazine the author attributes not to purely chemical reactions, but rather to changes in the colloidal dispersion and the solvation of the system as results of such reactions.

Electronographic Investigation of Rubber. K. I. Krylov, *Kauchuk i Rezina*, 1, 24-32 (1938). **SN-7.**

The principles involved in electron microscopy and the apparatus used are described. An electronogram of a thin film of natural rubber (NK) showed concentric rings. This indicates the amorphous structure of the rubber. When the film was stretched, the electronogram showed clearly a series of individual points. These were used for calculating the structure of rubber. The author concludes that rubber has an orthorhombic symmetry, the sides of which are $a = 12.3$ Å, $b = 8.3$ Å, and $c = 8.1$ Å. These values correspond to the ones given by Mark and Susich[3] and Meyer and Mark.[4] Frozen, slightly stretched films of rubber gave much clearer diagrams. The interference points are more intense and of a higher order. Frozen samples showed the appearance of crystallites having the same dimensions as above, but differently oriented in the plane of the film. Also investigated was polymerized chloroprene (Sovprene). Its film gave a clear electronogram without any outside help such as stretching, etc. Krylov assigns to chloroprene an orthorhombic symmetry, $a = 9.3$ Å and $b = 8.23$ Å. For checking these values and in order to determine the value of c, a diagram with a higher order of reflection will have to be obtained. Sovprene also gave amorphous rings corresponding to the periods 2.23, 1.47, and 1.18 Å. The two latter closely approach the distance between C atoms within a chloroprene monomer molecule.

Colloid-Chemical Investigation of Various Kinds of Latex. B. A. Dogadkin and B. M. Kovarskaya, *Kauchuk i Rezina*, 1, 33-44 (1938). **N-1.**

The object of the investigation was latex and a number of its concentrates: latex (*Hevea Brasiliensis*), sp. gr. 0.935, d.m. (= dry matter) 43.5%, yellow-brown; Jatex, sp.gr. 0.941, d.m. 61.3%, white; Revertex, sp.gr. 0.982, d.m. 72.3%, yellow-white (traces of S were found in the sample); Revertex T, sp.gr. 0.936, d.m. 61.23%, white; and Revultex, sp.gr. 0.983, d.m. 70.2%, yellowish, sulphur content 5.2%. The above samples were studied for their viscosity, stability, and ability to mix with ingredients commonly used in compounding rubber.

The viscosity was determined in an apparatus similar to the one made by Madge.[5] The diameter of the capillary tube was 3.18 mm. At the same concentration the viscosity of the investigated samples increases in the following order: latex, Jatex, Revultex, Revertex (standard), and Revertex T. Jatex, Revertex and Revultex were investigated at a concentration of 10-60%, Revertex 10-50%, and latex 10-40%. At 40% concentration all the samples had a sharp rise in their viscosity-concentration curve. It was also observed that above 40% the effect of structural viscosity becomes evident. The viscosity-temperature relation is given by $\eta_t = \eta_0 (1-\alpha_t)$ where η_t and η_0 are the relative viscosities at temperature t and 0° respectively, and α is a coefficient depending on the kind of latex. The effect of KOH and NH_3 on the viscosity was also investigated. The addition of either of these lowers the viscosity of latex, Jatex, Revertex, and Revultex. The sharpest drop occurs upon the addition of the first ½%. The effect of KOH in lowering the viscosity is somewhat smaller than that of NH_3. In the case of Revertex T the addition of up to 1% of base causes the viscosity to increase; upon further addition, however, its viscosity decreases. This is attributed to a higher original alkalinity of Revertex T.

In investigating stability, the coagulation thresholds and dilution thresholds were determined. The investigated materials in order of their decreasing stability under the influence of electrolytes are: latex, Jatex, Revertex T, Revertex, and Revultex. The tested electrolytes did not affect all the samples in the same way. In order of diminishing coagulating power for the respective samples they are:

Latex ..... $FeCl_3$, CH_3COOH, $BaCl_2$, $MgCl_2$, NaCl
Jatex ..... $FeCl_3$, $BaCl_2$, CH_3COOH, $MgCl_2$, NaCl
Revertex T ... $FeCl_3$, $BaCl_2$, CH_3COOH, $MgCl_2$, NaCl
Revertex ..... $FeCl_3$, CH_3COOH, $MgCl_2$, $BaCl_2$, NaCl
Revultex ..... $BaCl_2$, $FeCl_3$, CH_3COOH, $MgCl_2$, NaCl

Generally, the order of ions follows the Schulze-Hardy law. An exception is the H ion (added as CH_3COOH) which exhibits a greater coagulating power than the bivalent ions. The values of the coagulation thresholds depend on the concentration of dry matter in the latex. The dilution thresholds were determined with both soft and hard water. With hard water Revertex could be diluted to a dry matter content of 8.78%, Revultex to 10.9%, and Revertex T to 15.3%.

[It appeared that latex and Jatex could be diluted almost infinitely under the conditions by which the test was carried out which involved complete coagulation and did not consider flocculation as a measure of instability. In this connection the article states, "In the case of latex and Jatex, flocs did appear when hard water was used, at figures of 43.5 and 14.85% of dry matter respectively for the two latices, but the flocs did not coagulate as was the case in the other samples.]

The effect of temperature on the stability was also investigated. The samples were frozen and then thawed on a water bath at 60-100° C. Observations were made on the thawed out samples. The temperatures given below indicate to what temperatures the samples could be cooled (then thawed) without forming irreversible systems. A system was considered unstable if it formed coagulum. Jatex was stable down to —20° C., Revertex to —45° C., and Revertex T to —10 to 20° C. Revultex and latex did not coagulate when kept for 12 hours at —45° C. The effect of +30-100° C. was also investigated. Revertex T was the least stable also with respect to heating. The coagulation threshold and the relative viscosity were determined both before and after freezing, and heating, the samples.

Observations were also made on changes taking place when various ingredients were admixed to latex and its concentrates. The following ingredients expressed in % of the sample were tested: precipitated sulphur 3%, ZnO 5%, powdered chalk 10%, kaolin 10%, and carbon black GET 5%. Revertex and Revultex proved the most stable; while Revertex T was the least stable. Finally, experiments were made to determine the stabilizing effect of latex and its concentrates on the above ingredients. For this purpose the sedimentation rate of the powdered ingredients was studied in latex and the concentrates. Latex and the concentrates affected the various ingredients differently. Beside latex, Revertex and Jatex proved most effective in stabilizing most of these ingredients, i.e., the rate of sedimentation of the ingredients was the slowest when suspended in latex, Revertex, or Jatex.

Procedure for Determining the Permeability of Water Vapor through Rubberized Fabrics. K. I. Samarina and L. S. Frumkin, *Kauchuk i Rezina*, 1, 45-48 (1938). **SN-8.**

The apparatus for determining the permeability consists of a glass beaker in which water is placed during the test. On the top of the beaker is placed the investigated material. Then comes the upper part of the assembly made of ebonite. It carries inlets for two glass tubes, of

[3] *Kolloid Z.*, 46, 11 (1928).
[4] *Ber.*, 61, 1939 (1928).
[5] *Trans. Inst. Rubber Ind.*, 6, 5 (1935).

which one is connected to $CaCl_2$ tubes, and the other to a water suction pump. It also carries two terminals, which on the inside are connected by the indicator and on the outside to a galvanometer circuit. As indicator serves a strip of filter paper saturated with a solution made of ⅓ a 20% $CaCl_2$ solution, ⅓ a saturated (at room temperature) solution of NaCl, and ⅓ distilled water. The paper is dried, cut in strips, and used when necessary. The upper assembly also acts as a cover and is hermetically sealed during the test to the glass beaker; the tested fabric separates the two. Water vapor penetrates the fabric and enters the upper assembly. There it is absorbed by the dry paper strips saturated with $CaCl_2$ and closing the two terminals, thus affecting the conductance, which in turn is recorded on the galvanometer. Details of construction and operation are given.

Electrical Control of Dryness of Powdered Ingredients Commonly Used in Compounding Rubber. R. T. Zhezherin, *Kauchuk i Rezina*, 56-8 (1938). **M-6.**

A description is given for a simple electrical set-up for controlling the degree of dryness of such powdered materials as chalk, kaolin, zinc, whiting, talc, magnesia, etc. The method is based on a change in the conductance of these materials taking place when their moisture content changes.

Application of Electron Analysis to the Study of Polymerized Chloroprene Structure. K. I. Krylov, *Kauchuk i Rezina*, 2, 26-31 (1938). **S-22.**

Krylov continued his study of Sovprene by the electron diffraction method. This time the chloroprene was stretched somewhat when the electronograms were taken. A mathematical analysis of the diagrams confirmed his first findings that a chloroprene unit has an orthorhombic symmetry with axes $a = 9$ Å, $b = 8.23$ Å, and $c = 4.79$ Å. Using the Laue and Brill formulae for computing the size of particles from their diffraction diagrams the author calculated the size of a chloroprene crystallite in the direction of its stretched axis to be about 25 Å.

Calculating the Optimum Vulcanization Period. V. V. Bulatkin, *Kauchuk i Rezina*, 2, 32-37 (1938). [Preliminary communication.] **SN-9.**

The author gives four formulae for calculating the optimum vulcanization period when the composition of the rubber is known. A number of tables and graphs are given from which the values of the various symbols appearing in the formulae can be taken. These tables and graphs contain data only for the more important ingredients of rubber. Tables and graphs for the minor ingredients are yet to be developed. With the aid of these formulae the vulcanization time can be calculated with an accuracy of 1% to 10%. The author tested these formulae on more than 100 compounds, of which the optimum vulcanization time was known. In the most cases the calculated results coincided with the experimental results.

Thermal Decomposition of Methane to Carbon Black. N. M. Indyukov and T. V. Prokof'eva. *Kauchuk i Rezina*, 2, 37-44 (1938). **M-7.**

The thermal decomposition of methane to yield carbon black was investigated at a temperature interval of 1050-1200° C. and at a rate of feeding the gas of 6, 18, 30, and 60 liters per hour. The simple apparatus used is described. The product and the gas leaving the decomposition tube were carefully examined. The authors arrived at the following conclusion. Temperature below 1050° C. were very inefficient as far as the output was concerned, also the product was of inferior quality. In the range between 1050 and 1100° C. the most favorable rate of the flow of gas is 18 liters per hour; this rate corresponds to a contact period of three to five seconds. In the interval of 1150-1200° C. the most favorable rate is 30 liters per hour corresponding to a contact period of two to three seconds. Within the investigated temperature range the optimum was found to be 1200° C. and a contact period of two seconds. In these conditions 72.2% of the C in the gas was converted to carbon black as compared to 40% given in literature. At higher temperatures the shorter the contact the better the product. At lower temperatures, 1050-1100° C., a short contact, 1.3-2.8 seconds, gives an inferior product contaminated with tar and naphthalene. The gas leaving the apparatus contained 82.7% H; thus yielding as by-product a gas suitable for hydrogenation processes. Sixteen references are appended.

(*To be continued*)

Additional Brand Names for WPB Carbon Black Nomenclature

BELOW are additional brand names of various types of carbon blacks not included in the original listing in our August, 1943, issue. The original report by the committee on Carbon Black Nomenclature did not have as one of its purposes the inclusion of every brand name of every producer. To provide a complete list INDIA RUBBER WORLD would appreciate hearing from any company whose brand or brands are still not listed or when new brands are placed on the market, in order that we may keep this listing correct.

CARBON BLACK NOMENCLATURE—BRAND NAMES BY PRODUCERS

	Symbol	Cabot	Columbian	Continental	Huber	Johnson	United	Witco	Imperial
Conductive Channel	CC	.....	.....	Under Classification	.....	.....	Voltex	.....	Excello X Excello 2X
Hard Processing Channel	HPC	Spheron #4	Micronex Mx II	Continental F	HX	Atlantic 98	Kosmobile S/ Dixiedensed S	6	Supreme SH
Medium Processing Channel	MPC	Spheron #6	Std. Micronex	Continental A	TX	Atlantic 109	Kosmobile/ Dixiedensed	1	Supreme MM
Easy Processing Channel	EPC	Spheron #9	Micronex W-6	Continental AA	Wyex	Atlantic E-42	Kosmobile 77/ Dixiedensed 77	12	Supreme VF
		Cabot	Columbian	General Atlas	Huber	Phillips	United		
Conductive Furnace	CF	.....	Statex A	.....	FB200	.....	(*)		
Fine Furnace	FF	.....	Statex B	.....	.....	.....	.....		
High Modulus Furnace	HMF	.....	Statex 93	.....	.....	Philback	Kosmos 40/ Dixie 40		
Semi-Reenforcing Furnace	SRF	Sterling	Furnex	Gastex	Essex	.....	Kosmos 20/ Dixie 20		
		Shell	Thermatomic						
Fine Thermal	FT	.....	P-33						
Medium Thermal	MT	Shell	Thermax						

(*) To be announced later.

Rubber after the War—IV

K. E. Knorr[1]

SYNTHETIC RUBBER WILL PROVIDE PRICE STABILITY. Because of vexing and risky changes in inventory values, rubber goods manufacturers are rightly concerned over the inordinate gyrations of rubber prices in the past. Disregarding chaotic price developments that resulted from greedy and clumsy supply policies of producers' control organizations, violent fluctuations of rubber prices are caused by a remarkable price-inelasticity of both supply and demand. The demand for the bulk of all rubber goods consumed is a joint demand. A person buys an automobile including tires, tubes, and numerous other rubber articles contained in motor vehicles. Only a very small proportion of the total value of the automobile can be attributed to the value of its rubber components. Hence even a doubling or trebling of rubber prices affects the price of an automobile only to a trifling extent. The demand for automobiles, indifferent to changes in rubber prices, changes roughly with the development of general business conditions. In other words the demand for rubber goods and therefore for rubber expands in a boom period and contracts in a time of depression quite irrespective of the development of rubber prices. If rubber prices range high, the demand for rubber may increase instead of diminish and may drive prices up still further if business conditions are flourishing. The opposite phenomenon may occur when rubber prices are very low.

On the other hand the supply of plantation rubber is rather price-inelastic because, in the face of low prices, the highly capitalized estate-producers do not contract supplies, but tend to increase outputs in order to broaden the incidence of high fixed costs. The majority of native growers in British Malaya, in contrast to most Dutch native producers, exhibit the same reaction because rubber sales constitute the sole source of their meager livelihood. In times of high rubber prices supplies can be increased if the industry is not operating near capacity. But the necessity of recruiting additional labor often results in a considerable time lag before increased supplies are released. If a growing demand pushes the price level up while the industry is working at capacity, supplies cannot be expanded in the short run since it takes from five to seven years before newly planted *Hevea* trees reach a tapping age.

These fundamental conditions must be understood to appreciate adequately the argument that domestic production of all rubber consumed in the United States would do away with the violent fluctuations of rubber prices. The cost structure of the synthetic rubber industry shows the same importance of high fixed costs that characterizes the estate company. Therefore unless the industry is monopolized, the reaction of synthetic manufacturers may well be similar to that of the estate-producer. If the industry is monopolized, price stability will be bought dearly at the cost of high rubber prices.

The very fact that the future sources of the world's rubber supply will be more diversified than before, both structurally and geographically, is likely to prevent a certain measure of price volatility. For the purpose of reducing effectively the amplitude of price swings, a stock program, such as has been suggested for reasons of security, would serve admirably if executed in the interest of the industrial and ultimate consumer rather than in the interest of rubber producers. While such a measure, especially if organized on an international basis, could be expected to prevent excessive price fluctuations by the manipulation of supplies, a further smoothing of rubber price fluctuations, from the demand side, would follow successful efforts to subdue to some extent the fluctuations of the business cycle.

EFFECT ON EMPLOYMENT OF HIGH DOMESTIC RUBBER PRODUCTION. The notion that the domestic production of all rubber consumed in this country will furnish American labor with additional employment is a stock argument applied to every industry desirous of protection and has been proved fallacious by generations of economists. To insure the highest possible degree of employment after the war is beyond doubt a most desirable social objective, although to accomplish it at any price would be economically retrogressive and politically dangerous. However a reasonably satisfactory solution of this problem is possible by methods that admit the economic allocation of productive resources. Maximum employment need not necessarily be obtained at the cost of reduced real income. The attempt to increase employment by heightening barriers in the way of international trade would mean just that. On general grounds; therefore, high-tariff protection of the synthetic rubber industry should be condemned as a means toward augmenting the volume of employment.

Besides postwar subsidization of about one-half of the synthetic rubber industry now building would furnish only a negligible increment of employment because this industry is a highly capital-intensive industry, not a labor-intensive industry. Unless the fluctuations of the business cycle can be effectively reduced in range, employment in this industry should also prove subject to considerable instability. Most important of all, however, to insure this employment by protection would mean a corresponding contraction of employment in higher-wage American export industries.

Indeed, following this discussion of why subsidized synthetic rubber production on a large scale is unnecessary and uneconomic, a few words need to be said about the adverse effects of a sweeping protectionist arrangement. Some of these disadvantages have already been mentioned.

Overall Considerations

Protection would exact heavy financial sacrifices from the American consumer of rubber goods. Protection would blunt the impetus toward rapid technological progress in the industry itself. By raising rubber prices, protection would seriously retard, if not thwart, the development of new bulk uses of rubber. Indeed, as an impediment to sharply expanding consumption, protection would have its most vicious effect. Protection also would diminish the purchasing power of foreign countries that are large importers of American goods. Before the war the foreign-exchange position of the large rubber producing countries, particularly that of Great Britain, depended greatly on the foreign sale of rubber. The dollar exchange acquired thereby was applied toward the servicing of American loans and, above all, toward the payment of many hundreds of articles imported from the United States. It merits mentioning in this respect that throughout the decade preceding World War II the sterling area

[1] Food Research Institute, Stanford University, Calif.

—despite large rubber exports—labored under difficulties in meeting its dollar commitments since the sterling bloc normally had an adverse balance of trade with the United States.

Owing to the wartime liquidation of a large portion of her foreign investments, Britain's pound sterling will be in an even weaker position in relation to the dollar than before. Radical diminution or complete cessation of American rubber imports would therefore necessitate a corresponding contraction in Britain's imports of American manufactures and farm products. To the economies and the plane of living of the Far Eastern rubber growing areas themselves, that is, chiefly to the British and Dutch dependencies which are to be delivered from Japanese overlordship, such a step would constitute a terrific shock. Politically and morally, it would be almost imperative for the Allies to discover and finance ways and means of replacing rubber as an important source of Malaysian livelihood.

Finally, it should be added that the United States has been assuming world leadership in international efforts at effecting a freer flow of international trade. To keep the non-economic part of the synthetic rubber industry a going concern by protection would indeed present a curious discrepancy between word and action.

As Sir Andrew McFadyean, a representative of the British rubber plantation industry, put it: large-scale subsidization of the American synthetic rubber industry "would be economic nationalism, naked and unashamed . . . . it would be an aggravation of the economic frictions which many regard as the causes of the present war."

Sir Andrew was scarcely speaking from an objective point of view. But, exaggerated as this statement is, it echoes the warning given by Vice President Wallace when he said that American protection of synthetic rubber production might become the cause of World War III. If pushed to an extreme, the Latin American rubber development scheme, officially sponsored by the Department of Agriculture, might constitute a similar threat to the livelihood of the Malaysian rubber producing countries.

With the outbreak of war in 1939 American interest was aroused in the possibility of creating an alternative supply of plantation rubber in South America. It was soon realized that 12 to 20 years must elapse before substantial quantities of rubber would become available from a large plantation industry to be set up across the Caribbean. Nevertheless the notion of fostering such an industry in Latin America was accepted by some officials as a long-run proposition, since such a policy would obviate a long and precarious ocean haul from the Asiatic producing countries in a future war emergency.

Thus, Secretary of Agriculture Wickard declared in his annual report for 1941: "What type of world order will come afterward, we do not know. That it will justify dependence on distant owners of strategic raw materials is highly problematical."

More recently Rubber Director Jeffers stated that it would be good "insurance" to encourage a South American rubber industry in addition to the synthetic rubber plants that will be operated after the war. However the Latin American rubber development project is not based solely on considerations of military security. Some argue that it would implement the hemispheric "Good Neighbor Policy" in the economic field by providing some Latin American republics with a much-needed cash crop, which, in turn, will strengthen their internal economies and augment complementary trade between the Americas.

After Congress passed a bill in 1940 appropriating funds for investigatory purposes, the Bureau of Plant Industry and the Office of Foreign Agricultural Relations worked out a comprehensive program. Survey parties were dispatched to promising areas to study their physical suitability for *Hevea* cultivation. Experimental and demonstration stations were set up to assemble and propagate high-yielding clones of *Hevea* and to breed disease-resistant strains. Mixed commissions were formed in each of the twelve cooperating countries involved, to facilitate the extension and implementation of the program. By the beginning of 1942, about 15 million *Hevea* trees had been planted. Since then this figure has presumably been doubled, if not trebled. But a large part of the far-flung project is still in the early nursery stage.[2]

What are the prospects of this great plan of "bringing rubber back home"? The *Hevea* tree was indigenous to South America, and uncounted millions of wild trees grow naturally in the Amazon basin. Beyond doubt, basic natural conditions are favorable for the development of a Latin American plantation industry. Whether they are more favorable than in southeastern Asia is a controversial question. It is definitely wrong to assume that all of America's vast equatorial belt is suitable for *Hevea* cultivation. Climatic conditions aside, rather exacting soil, drainage, and relief tolerances narrow considerably the area satisfactory for private plantation enterprise. Some authorities are of the opinion that generally the wintering season is more pronounced in Latin America than in Malaysia. If so, this would result in a more marked seasonal output decline.

The greatest physical hazard is a rampant fungus leaf disease peculiar to and coextensive with the native *Hevea* tree in the Western Hemisphere. It does not exist in the Asiatic producing countries. While less dangerous in mixed jungle growth, in closely spaced plantations, it occurs epidemically, and the frequent consequence is mass defoliation and death to the trees. However the great variability of *Hevea* makes it possible to breed strains resistant to leaf blight. American plant biologists apparently have succeeded in developing such material. Let us assume, therefore, that this problem will be solved satisfactorily and that the plantations will be located in areas physically as suitable as those in the Far East.

In addition to a favorable physical environment, a rubber plantation industry requires a suitable cultural environment. Several factors contributed to the brilliant expansion of the Malaysian rubber industry: a labor supply, qualitatively adequate though largely migratory, and qualitatively satisfactory; a well-developed transportation system, in areas marked by relatively short overland distances; the existence of a managerial staff experienced in tropical plantation enterprise; and abundance of capital and research facilities.

We may assume that American assistance to the South American rubber producing industry will be largely in the form of research and capital investment. The training of an adequate managerial staff, though it may proceed slowly, can be accomplished. Transportation will present enormous difficulties, due to the inaccessibility of many physically suitable areas in the Amazon Valley. Not all traffic can be water-borne, and the lack of roads constitutes a physical barrier of serious proportion. The barrier can certainly be overcome in time, but no matter what solution will be discovered, inland transportation is likely to present a cost factor that will put South American production of plantation rubber at a disadvantage as compared with Malaysian.

The most important and perhaps prohibitive handicap to a large American rubber plantation industry lies in the

[2] *Hevea* Rubber Culture in Latin America", R. D. Rands, INDIA RUBBER WORLD, June, 1942, pp. 239-43, July, pp. 350-56, Aug., pp. 461-65; "Progress in Hemisphere Rubber Plantation Development", E. W. Brandes, *Ibid.*, May, 1943, pp. 143-5.

scarcity of suitable labor. Rubber production is labor-intensive, and the optimum tapping of rubber trees requires a skill not easily learned. In crass contrast to the dense population of southeastern Asia, the population density in the Brazilian rubber region is less than one person a square mile, and the majority of jungle inhabitants are backward Indians. The history of the Ford rubber plantations in Brazil provides an illuminating test case. From the beginning of this generously capitalized enterprise, lack of labor delayed its development and prevented its expansion. Even when the required numbers ran to only a few thousands, the difficulties encountered were nearly insuperable. The Companhia Ford attempted to recruit workers in the coastal strip of Brazil, but despite high wage offers the results were plainly disappointing. Plans to import labor from the Far East and the Caribbean islands had to be dropped because of adverse Brazilian immigration laws and the high costs involved.

Extraordinary wartime measures, made possible by close cooperation between the United States and Latin American governments, have apparently succeeded in mobilizing a labor force that should suffice for present purposes when the total plantation acreage is still relatively small and no tapping possible. It should also be mentioned that high recruiting costs and wage rates are considered irrelevant when the United States is willing to pay more than 50¢ a pound for Latin American rubber in order to get as much as possible. Perhaps it may be possible, when peace comes, to secure a labor staff sufficiently large to operate a South American rubber plantation industry of moderate size. But on account of the high cost of such labor, of expensive transportation, and of high capital costs, such an industry would have a most difficult time competing freely with a reconstituted Malaysian rubber industry. It is a great temptation to forecast that the more ambitious the project, the greater will be the failure. Latin American spokesmen have on several occasions voiced their apprehension that the United States might withdraw subsidization from the new American industry now planned.

Schemes that envisage the development of rubber plantations on some of the West Indian islands or in some of the "Banana republics", such as the *cryptostegia* development in Haiti, sound more promising, especially if undertaken in the form of a smallholders', peasant enterprise combined with subsistence farming. No reason has been advanced so far, however, that would let us anticipate an industry that could compete with Malaysian plantations. The question, then, is this: Should the United States foster the development of a large plantation-rubber industry in Latin America that would duplicate redundant production facilities in the Far East and would require long-run subsidization through a substantial tariff preference or in some other form?

We have seen that for purposes of military security such a policy is unnecessary. Indeed, if subsidization there must be, protection of a domestic and ideally accessible rubber supply would be clearly preferable and possibly less costly. If the scheme is supported for the sake of extending this country's export markets to the South, such expansion would, of course, be offset by a diminution of United States markets in Europe and in the Far East. As regards the desire for buttressing political relations within the New World, it should not be difficult to discover development projects that rest on a less precarious basis, are more promising to the Latin American countries in the long run, and far less costly to taxpayers and consumers in the United States. Hence if the Administration wishes to proceed with the present project, it seems desirable to keep the program to a moderate proportion. After the war the United States will presumably have to decide whether to assume the burden of continued subsidization or to write off the investment incurred as an ordinary war expenditure.

Conclusions

The foregoing had to be written necessarily on the basis of a variable set of assumptions. We found that the United States can obtain a secure rubber supply without resorting to the costly protection of more than a small part of a big war-built industry. Perhaps the ingenuity of American chemists and engineers will achieve the seemingly impossible and make any form and amount of subsidization unnecessary. It would be desirable to subsidize a small portion of the synthetic rubber industry only if the effective price differential between artificial and natural rubber should be too much in favor of the latter. Such intervention should not attempt to subsidize an American synthetic rubber industry capable of supplying more than about one-fourth or one-third of the country's normal consumption. A moderate decision along this line would be wise and beneficial to the producer and consumer of rubber goods and, in the long run, also to the producer of synthetic rubbers.

Moisture Condensation on Ceilings

CEILING sweat often is a nuisance; thus the frequent question, "How can we prevent it?" Those who have experienced poorly insulated roofs or roofs not insulated at all have very likely known it almost to "rain" when the outdoor temperature was low, the indoor temperature normal, and the air humid. Briefly there are two ways to prevent ceiling sweat: apply an ample thickness of suitable insulation to the roof; keep the air "dry" inside the building or room.

Regarding the second method, the more difficult of the two, it is not necessary to keep the air "perfectly dry." But to prevent condensation in any room it *is* necessary to hold the humidity of the air down low enough; so no "dew point" will be established on the ceiling. By keeping the air properly dry it will absorb any particles of sweat that may collect on the ceiling, and dripping will thereby be eliminated.

Here is a new rule developed to simplify computation of these-type problems. It gives the limiting relative humidity under a wide range of conditions: Subtract the outdoor temperature from the indoor temperature (both in degrees F.), multiply the difference by 0.19, and then subtract the product from 100. The remainder is the relative humidity limit. Should a greater relative humidity be permitted in the room, ceiling condensation is likely to occur.

But (and this is important) the above rule applies only to a well insulated roof—four inches of concrete, plus two inches of corkboard, plus five-ply roofing. For a roof of four-inch gypsum composition, use 0.3 in the rule instead of 0.19. For a roof of 2½-inch tongue and groove spruce planking, plus five-ply roofing, use 0.5; for a roof of 1½-inch tongue and groove spruce planking, plus five-ply roofing, use 0.62; and for a roof made of bare concrete four inches thick, use 0.94.

EDITORIALS

From Defense to Offense

THERE is a remarkable and, of course, not too unexpected parallelism between the fortunes of war as applied to our Armed Services and the progress of the rubber program on the home front. In both cases there have been setbacks, and during the last year or more the major efforts have been those of defense. There have been hectic times while we worked desperately in all too short a time, to build on one hand an Army and Navy first for defense and then for offense, and on the other hand, an industry for producing synthetic rubber to replace our source of natural rubber which we lost when the Japanese conquered Malaya and the Dutch East Indies. Now that both of these requirements have been achieved and our Armed Services are carrying the fight to the enemy, the demands on the country as a whole are not any less, but are different in character. It is no longer so much a problem of training and equipping tremendous numbers of men in a race against time as it is maintaining and supplying these men so that nothing will interfere with their efforts to obtain victory in the shortest possible time.

In the same manner, the demands on the rubber industry and the Office of the Rubber Director for the continued progress of the rubber program and its successful completion are no longer those of building a defense against a shortage of rubber, but are now shifted to an offense with the use of the newly provided materials. It is a tribute to former Rubber Director Jeffers that he correctly sensed the changed requirements for the administration of the program, and in his letter of resignation told the President that ". . . the greatest contribution I can make in the present emergency is to return to the on-the-job handling of the operations of the Union Pacific Railroad." Jeffers in effect turned the job over to Col. Bradley Dewey, who, having been in charge of the technical phases of the program, is better suited to take over the direction of the whole program now that the technical phases will predominate.

It is believed timely, however, to point out that during this phase of using the increasing tonnage of government synthetic rubbers in production there should be no reduction in the cooperation between the various companies of the industry and the Office of the Rubber Director in their exchange of information and "know how" on the best and most efficient means of making rubber products, particularly tires, with these new materials. There will be many hard battles fought before the war is won, and there are many difficult problems in the large-scale conversion from natural to synthetic rubbers to be solved before this program is really finished. If there is any considerable duplication of effort in the solution of these industry conversion problems, it will take just that much longer for the necessary improvements to be made in the rubber products required for military and civilian use. As Colonel Dewey said in a recent talk before the American Chemical Society at Pittsburgh:

"So long as all continue to pull together in a common effort to make America immune from the effects of losing its supplies of overseas rubber, the prospects for lower costs and better synthetics should excite the imagination of every chemist."

He might also have added that with the continued cooperation of the various industrial organizations, the success of this second phase should be a fitting complement to the success of the first phase; while at the same time any lesser degree of accomplishment in the second phase would seriously detract from the results of the whole program.

The Rubber World Changes

AT NO time during the past one hundred or more years of the rubber industry has there been witnessed changes that will have such drastic and far-reaching effects on the future of this industry as have been taking place during the past year or two. The discovery of vulcanization, the use of organic accelerators, the use of carbon black in tire tread compounding, etc., were all of tremendous importance and contributed greatly to the growth of the industry, but the whole industry would be on its way to becoming non-existent by now if we had not been successful in building up our synthetic rubber production to its present level during the past two years.

At the same time the production of natural rubber has not been completely stopped; but as far as we are concerned, it has only been partially suspended because of the war. Some time in the future, it is expected, natural rubber will become available in something like its prewar volume. This means that after the war we will have large amounts of both natural and synthetic rubbers for use in the manufacture of rubber products.

In this connection our readers will notice that we have added the words, "Natural and Synthetic", under our name and that we have reduced the relative importance of the word "India" in this name. We have made these changes in order to make it clear to both old and new readers that we are keeping and will continue to keep our content up-to-date and authoritative, just as it has always been during the past fifty-four years, even though the rubber world has not only changed, but has grown to include the manufacture of rubber by chemical means as well as the production of rubber from natural sources. We also believe that the term "India rubber" as instituted by Priestly late in the eighteenth century has had less and less significance of late, in particular as far as the word "India" is concerned, and therefore although it is still retained, it is given less prominence in comparison with "Rubber World."

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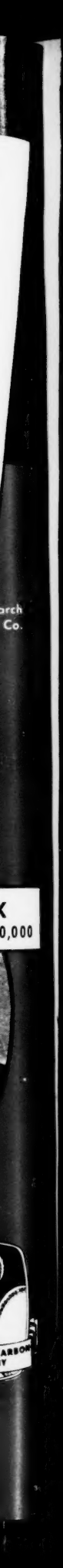


What the Rubber Chemists Are Doing

Results of Compounding Research on Synthetics Feature Rubber Division Meeting

THE fall meeting of the Division of Rubber Chemistry, A. C. S., to be held at the Hotel Commodore in New York on October 5, 6, and 7 has more than half of the 30 papers being presented devoted to the results of recent work on the compounding of synthetic rubbers. The technical sessions have been scheduled for all day Tuesday, Wednesday morning only, and all day Thursday. The business meeting will take place during the Thursday afternoon session, at which time the results of the letter balloting for the election of officers of the Division for 1944 will be announced. The Divisional banquet will be held in the Main Ballroom of the Commodore on Wednesday evening. No speaker is scheduled, but an excellent program of entertainment has been arranged. The committee in charge of the preparations for the meeting is headed by E. B. Curtis and consists of John T. Blake, H. I. Cramer, Walter J. Geldard, Charles R. Haynes, John H. Ingmanson, Harry E. Outcault, Peter P. Pinto, and B. B. Wilson.

Much of the information contained in the papers to be given at the technical sessions should be of immediate practical significance to rubber chemists and technologists in their present problem of using larger and larger amounts of synthetic rubbers. Eighteen papers report the results of compounding research on synthetic rubbers, and of these eleven deal specifically with GR-S, four cover all of the major rubbers, and three discuss the properties of rubbers not a part of the government program. Seven papers have to do with new analytical methods for the physical and chemical testing of synthetic rubbers, and four of these have to do with methods of measuring the properties of rubbers at low temperatures. There are two papers on polymer research; one on the effect of carbon black on the decomposition of peroxides, one on rubber elasticity, and one on rubber latex. The meeting will be opened with an introduction by the chairman of the Division, John T. Blake at 11 a.m. on Tuesday, October 5. Available abstracts and titles of papers for which no abstracts are available follow:

Behavior of Carbon Blacks in Various Rubbers in a Banbury. This study covers 13 types of blacks. The distinction that exists among these in physical and chemical characteristics and reenforcement is also evidenced from their behavior in the Banbury. Detailed observations were made on these blacks as to power consumption and temperature rise in a Banbury "B" when mixed in five different types of synthetic rubbers and in smoked sheet. Observations were also made on the behavior of EPC black and SRF black when mixed in GR-S (Buna-S) at different Banbury speeds and with the circulating water at different temperatures. Addition time of the softener and variation of the black loadings were also studied. Blacks of larger surface, high volatility, and acid pH consume more power and generate more heat than blacks of smaller surface, low volatility, and alkaline pH. Thus in GR-S a black having four times as large a surface as another black, higher volatility, and an acid pH will consume 25% more power and generate 100° F. higher temperature.

The rubber is also an influencing factor. It takes a third less power to mix channel black in GR-I (Butyl) than in Buna-N and approximately 10% less power to mix the same black in smoked sheet than in GR-S. The same black registers 20° F. higher in GR-S than in smoked sheet. In Buna-N it is 40° F. higher.

For the same mixing cycle, faster Banbury speeds lead to more power consumption, higher temperatures, and improved extrusion. Less power is consumed when the circulating water is warmer. The study includes complete rubber test data. I. Drogin, F. W. Dillingham, H. W. Grote, United Carbon Co., Charleston, W. Va.

Plastication and Processing of GR-S. In research work on polymers it is often assumed that, in general, the viscosity or plasticity of the mixed compound is a direct measure of its processing characteristics. It was observed, however, that compounds formulated from GR-S treated in a Gordon plasticator invariably tubed faster and smoother than similar compounds made from cold milled polymer although the compounded viscosity of the former frequently was higher. Inasmuch as these observations were at variance with laboratory predictions, it was decided to investigate the fundamental nature of plasticity and its relation to processing.

The results obtained indicate that viscosity measurements bear a direct relation to the power required in tubing, but do not correlate with tubing rates. The latter in turn depend upon worm speed and the surface condition of the mixed compound, smoother surfaces tend to give faster speeds regardless of viscosity. The degree of swell of the tubed member upon exuding from the die is also found to bear a direct relation to relative surface smoothness. It is possible, therefore, to predict tubing characteristics with a reasonable degree of accuracy from a knowledge of the plasticity or viscosity of the finished compound in conjunction with an estimate of its relative surface smoothness. Surface smoothness may be achieved by hot breakdown, increasing softener ratios, or increasing pigment ratios. Thus the faster tubing rate and smoother appearance resulting from Gordon plastication is explained by the high temperatures developed during breakdown. These high temperatures, however, exert a deleterious effect on the physical properties of the subsequent vulcanizate.

The data are not sufficiently extensive to draw valid conclusions with reference to correlation between benzene solubility of the raw polymer and processing characteristics. There is evidence, however, that higher benzene solubility may result in a more favorable processing history. Cold milling was found to increase benzene solubility, presumably rupturing the gel structure formed during polymerization. Hot milling or Gordon plastication, however, reduced benzene solubility. Further investigation is required to determine if this latter effect is due to the formation of a gel structure or if it represents a depolymerization resulting in benzene insoluble end products. G. R. Vila, Naugatuck Chemical Division, United States Rubber Co., Naugatuck, Conn.

The Processability of GR-S and Its Improvement by Chemical Means. A study of the processability of GR-S has led to the conclusion that no correlation exists between the plasticity of a GR-S sample, as measured by several common types of plastometers, and its behavior on a mill. One reason for the difference in behavior during mastication between GR-S and rubber may be the fact that oxygen plays a much smaller part in the breakdown of GR-S than it does with rubber. Since plasticity measurements cannot readily be used in the development of processing agents for GR-S, a new type of test was developed: millability test in which the time necessary to form a smooth band on a 70° C. laboratory mill is measured.

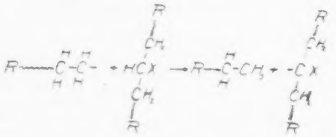
A new class of processing agents for GR-S has been developed. These compounds function by decreasing the breakdown time of GR-S, decreasing the time necessary for the incorporation of compounding ingredients, and improving the processability of the compounded stock. These agents are effective when used in quite small amounts, 0.5 to 4% on the elastomer, and therefore appear to be true chemical processing aids rather than physical softeners or lubricants. Bernard M. Sturgis and John R. Vincent, Jackson Laboratory, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

Theory of the Thermoelastic Phenomena for Rubber. There are three thermoelastic phenomena for rubber and rubber-like materials. (1) They change their temperature on fast stretching. (2) If stretched by a constant load (isotonic stretch), they contract visibly when heated. (3) The stress in rubber kept at constant extension (isometric stretch) increases with rising temperature. The change in temperature on fast stretching is negative (cooling) for low extensions. It passes through a minimum, becomes zero (adiabatic thermoelastic inversion point), and finally positive (heating) for increasing extensions. Rubber stretched isotonically is anistropic in its thermal behavior. It possesses a negative linear thermal expansion coefficient in the direction of the stress

and a positive one perpendicular to the direction of the stress. Both for isotonic and isometric stretch there exists a thermoelastic inversion point at a critical extension, which is about half of the value of the critical extension for the adiabatic thermoelastic inversion point. The theory of the authors explains these phenomena quantitatively. The visible contraction of isotonically stretched rubber, when heated, is due to the fact that the linear thermal expansion coefficient of stretched rubber is negative and of the magnitude of the (cubic) thermal expansion coefficient for gas. The thermoelastic inversion points are determined in a simple manner by the cubic thermal expansion coefficient of unstretched rubber. Eugene Guth, University of Notre Dame, Notre Dame, Ind., and Hubert M. James, Purdue University, Lafayette, Ind., now at Massachusetts Institute of Technology, Cambridge, Mass.

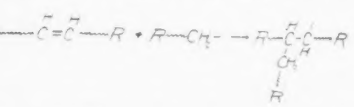
Mechanism of Branching. Osmotic pressure and viscosity studies of dilute solutions of certain synthetic high polymers indicate properties which can be explained by partial branching. It may therefore be interesting to consider the conditions under which high polymers, generally polymerizing in straight chains, undergo branching. Two specific cases shall be discussed:

In one the free valence on the polymer-chain, required for the branching to occur, is created by splitting off a hydrogen atom or a substituent:



The growing chain may either be attached to the polymer and there form a branch, and the H-atom (or substituent) acts as a radical to start a new chain, or the hydrogen might saturate the growing chain, and the free valence created on the other chain forms the origin for a side chain to grow.

In the other case a double bond in the chain is opened by collision with a growing chain, and the origin of further growth is created while a branch is formed.



It is possible to show that the rate of polymerization, especially in the later stages of these reactions, might be measurably influenced by branching. G. Goldfinger, Godfrey L. Cabot, Inc., Boston, Mass., H. Mark and W. Zybert, Polytechnic Institute of Brooklyn, Brooklyn, N. Y.

Unsaturation of Polyisobutylenes and Butyl[1] Rubber. Reactions with Nitrosobenzene, Thiocyanogen, Iodine Monochloride, and Ozone. The reactions of polyisobutylenes and of isobutylene-isoprene copolymers with nitrosobenzene, thiocyanogen, iodine monochloride, and ozone were studied to determine the low degrees of unsaturation possessed by these polymers. Unsaturation values based on the use of nitrosobenzene appear to be high because the addition reaction is accompanied by oxidation phenomena; while those with thiocyanogen are complicated by apparently incomplete reaction and by the simultaneous formation of polymerized thiocyanogen. The iodine monochloride reactions generally lead to high values through the occurrence of substitution reactions. When ozonized air is passed through a solution of the polymer in carbon tetrachloride, the intrinsic viscosity rapidly decreases to a minimum value characteristic of the mean size of the polymer fragments existing originally between successive double bonds. Unsaturation values based on the limiting viscosities of the degraded polymers appear reliable and are in reasonably good agreement with values determined by analysis of the end groups of the products. The ozone degradation method is quite sensitive and has the advantage of being applicable to polymers possessing unsaturation values too low to be measured readily by other more conventional methods. John Rehner, Jr., Standard Oil Development Co., Elizabeth, N. J.

[1] Trade Mark.

Organic Structure of Linear Polyesters and Their Rubber-Like Properties. Most high molecular substances have properties somewhat reminiscent of natural rubber when suitable swelling agents are present or if the examination is made within a favorable temperature interval. In terms of recent theory the structural requirements for a compound to exhibit more or less reversible stress-strain behavior are few. We need only secure organic molecules of sufficient length and flexibility which are so constituted as to remain or become amorphous in the temperature range in question and to provide intermolecular ties or cross-links at proper intervals.

The present paper is an attempt to relate the structure of linear high polymers to their rubber-like properties. Inasmuch as the linear polyesters provide a series of definite compounds, which are easily prepared and in which the composition can be readily varied, these have been selected as model polymers for investigation. By employing mixtures of ethylene and propylene glycols, polyesters are prepared with pure succinic and sebacic acids and mixtures of the two. Phthalic acid is employed in some cases to illustrate the effects of high polarity. All of the polyesters produce rubber-like substances on vulcanization by heating in the presence of benzoyl peroxide. Both gum and loaded vulcanizates are prepared and their properties studied. Partially unsaturated polyesters in which a small part of the saturated dibasic acid is replaced by maleic acid are also investigated as gum and as loaded vulcanized compositions. These compounds require much less peroxide to reach the same state of cure than do the saturated compounds.

The polyesters can be mixed in the usual manner on mixing rolls, but because of their relatively low viscosities they must be handled on as cold a mill as possible. Good dispersions of iron oxide and calcium carbonate are easily obtained, and these fillers, in a finely divided state, provide excellent reenforcement. Ultimate tensile strengths of 3000 p.s.i. have been obtained in the case of the saturated polyesters. Alkaline pigments such as ZnO and MgO must be avoided since they cause hydrolysis of the esters and loss of rubber-like properties. Carbon blacks also are not satisfactory because they react with the peroxide curing agents and prevent proper cure.

Stress-strain and brittle temperature data have been obtained on a large number of polymers chosen so as to illustrate the effect of chain structure on these properties. It is shown, as would be expected, that increase in molecular weight leads to higher ultimate tensile strength, other things being equal. However most of the results are reported on polymers having comparable average chain lengths in order to eliminate this variable. The results show that the orderliness of the arrangement of the units making up the chain molecules and the concentration of polar groups per unit of chain molecule length have a profound effect on properties. Regular structures, other things being equal, lead to vulcanizates having the greatest ultimate tensile in loaded stocks. Even in gum vulcanizates, which in most cases are weak, regularity of structure has a pronounced effect in improving tensiles. The brittle temperatures and oil resistance of the vulcanizates vary with the concentration of polar groups present and are not dependent on regularity of the chain structure. Finally, evidence obtained in this work indicates that the vulcanization process occurring in the case of the polyesters is a random cross-linking of units of neighboring chain molecules. The similarity to the vulcanization process for natural rubber tends to substantiate the cross-linking theory of vulcanization in which primary valence linkages are produced between chain molecules. C. S. Fuller and B. S. Biggs, Bell Telephone Laboratories, Murray Hill, N. J.

Linear Polymer Gums: Compounding and Properties of the Vulcanizates. The linear polymer gums are new types of synthetic vulcanizable elastomers. The vulcanizates resemble those of natural rubber in many respects and are indistinguishable from them on superficial examination, but differ from them in certain important properties. The gums themselves are essentially polyesters carried to a high molecular weight, made from dibasic acids and dihydric alcohols, either with or without an additional small percentage of an unsaturated component. They vary in physical state from very viscous semi-solid plastic masses to hard brown materials resembling gutta percha. They can be compounded in the usual way and vulcanized by means of benzoyl peroxide or, if the amount of unsaturation in them is increased, by means of sulphur and accelerators in the conventional manner.

The unvulcanized compounded stocks can be milled, extruded, calendered, cured, and otherwise processed with but slight modification of conventional rubber technique. Their building tack is excellent. Curing times are very short, and their curing curves are very flat. The vulcanizates have tensiles of 1600-1800 p.s.i. and elongations

of 300-600% when the stocks are compounded on a 12-inch mill and cured for 10 minutes at 20 pounds steam pressure in a six- by six-inch ASTM slab mold. The gums can be synthesized to give "tailor-made" products having specific desirable properties. These vulcanizates can be made to have outstanding resilience, electrical properties, heat stability, oil and solvent resistance, or low temperature flexibility, depending on the composition of the gum. Several of these properties can sometimes be built into one gum. The properties of the vulcanizates of the linear polymer gums presage many interesting developments in the field of synthetic elastomers. Specialized application requirements consistent with current availability of the raw materials needed can be met by appropriate adjustments in the composition of the gums. John K. Sumner and Robert J. Myers, Resinous Products & Chemical Co., Philadelphia, Pa.

Measurements of the Decomposition of Peroxides in the Presence of Carbon Black. The rate of decomposition of benzoyl peroxide and a number of inorganic peroxides and persulphates was studied. The reactions were carried out in benzene, xylene, and water in the presence and absence of carbon black.

Cuthbertson,[2] Goldfinger and Rossman,[3] and others have studied the mechanism of decomposition of benzoyl peroxide in benzene and xylene solution. The authors' measurements were carried out in the presence of carbon black. Cuthbertson proposed a mechanism for the homogeneous decomposition, and Goldfinger and Rossman one for the surface decomposition of this peroxide. From this latter investigation it appeared that during the decomposition in the presence of carbon black a surface poison was formed, which ultimately inhibited the reaction. It was possible to slow down the reaction by adequate pretreatment of the carbon. Thus far, however, it has not been possible to inhibit completely the surface decomposition. This study has now been extended to urea peroxide, ammonium persulphate, and potassium persulphate in water solutions. These are relatively stable compounds. The carbon black shows a similar accelerating effect on the decomposition of these compounds as on benzoyl peroxide, but the reaction is considerably slower. Up to now no evidence of surface poisoning has been found. G. Goldfinger and R. P. Rossman, Cabot.

The Effects of Blending Some Natural Rubbers with GR-S. The effects of blending some natural rubbers with GR-S in tire carcass stocks have been investigated. The natural rubbers were *Hevea*, Mexican resiniferous guayule, Mexican deresinated guayule, domestic resiniferous guayule, domestic deresinated guayule, chicle, goldenrod, and *Cryptostegia*. The blend ratio was 20% natural rubber, 80% GR-S. Two basic recipes, containing two parts of sulphur and three parts of sulphur respectively, were used. It was found that *Hevea*, *Cryptostegia*, domestic deresinated guayule, and Mexican deresinated guayule, in order of preference, were the best rubbers of those investigated for blending with GR-S. All the blends were tackier than the corresponding 100% GR-S stocks, and, when compounded with three parts of sulphur, the vulcanized blends excelled the 100% GR-S vulcanizates in the following respects: ultimate elongation at best cure and overcure when tested at 82° F. and at 200° F., tear resistance when tested at 82° F., and 200° F., tensile strength when tested at 200° F. The vulcanized blends were about equal to the 100% GR-S stocks in the following respects: mechanical efficiency, ultimate elongation after oven aging, tensile strength when tested at 82° F. Ross E. Morris, Arthur E. Barrett, Richard E. Harmon, all of the Rubber Laboratory, Navy Yard, Mare Island, Calif., and Theodore A. Werkenthin, Bureau of Ships, Navy Department, Washington, D. C.

Solubility and Diffusion of Sulphur in Synthetic Elastomers. The rate of solution of sulphur in various elastomers during milling has been shown to depend on several factors, the most important of which are temperature, fineness of sulphur, and its solubility. The solubility and rate of diffusion of sulphur in various synthetic elastomers have been determined, using procedures employed in a previous investigation carried out in these laboratories. The results show that sulphur is more soluble in GR-S than in crepe rubber above 55° C. and less soluble below this temperature. The solubility of sulphur in Perbunan, Hycar OR-15, and Butyl B-3 is less than rubber or GR-S in the order given at all temperatures. The rate of diffusion of sulphur through elastomers decreases in going from crepe rubber to Buna S, Hycar OR-15, and Butyl B-3 in the order given. A. R. Kemp, F. S. Malm, and B. Stiratelli, Bell Laboratories.

Heats of Vulcanization of Synthetic Rubbers. The heat effect during a chemical reaction frequently assists in the understanding of its mechanism. Previous studies on the heat of vulcanization of natural rubber have been extended to the Buna S, Buna N, neoprene, and Butyl rubber types of elastomers. The shape of the curve relating heat evolved to the amount of sulphur present is similar for natural rubber, Buna S, and Buna N. The amounts of heat evolved are of the same order of magnitude. A small percentage of carbon black produces a definite decrease in the heat evolved. Larger quantities of carbon black show little additional effect. Butyl rubber vulcanizes in the presence of sulphur with only a very slight evolution of heat. p-quinone dioxime vulcanization involves considerable heat evolution but this is due to side reactions and not the vulcanization itself. P. L. Bruce, R. Lyle, and I. T. Blake Simplex Wire & Cable Co., Cambridge, Mass.

Temperature Coefficient of Vulcanization of Buna S. Temperature coefficients have been determined for three Buna S stocks accelerated with dibenzothiazyl disulphide, over the temperature range 270 to 300° F. The stocks investigated included a pure gum control stock a tread-type stock reenforced with a channel process carbon black, and a mechanical goods type of stock containing a fine thermal black. Two independent methods were employed to determine temperature coefficients—physical properties and combined sulphur data. The average values obtained from physical data were 1.95 for a temperature change of 10° C. and 1.45 for a change of 10° F. The corresponding values obtained from the combined sulphur data were 2.06 and 1.49 respectively. Practically constant values of temperature coefficient were obtained in the presence or absence of reenforcing pigment and over a five-fold variation in sulphur content. The differences between the values obtained from physical and chemical data are within the limits of experimental error and are therefore not regarded as significant. La Verne E. Cheyney, Goodyear Tire & Rubber Co., and Robert W. Duncan, Firestone Tire & Rubber Co., both of Akron, O.

A Method for the Rapid Determination of Rate of Cure of Natural and Synthetic Rubber. The accurate evaluation of rate of cure of rubber compounds has long been a source of difficulty. The optimum tensile cure has had the most widespread use as a measure of rate of cure of natural rubber stocks. The uncertainties encountered with this method are well-known for natural rubber and are even greater for GR-S compounds which exhibit very flat maxima for the tensile strength-cure time curve. The failure of the T-50 and cold set methods for state of cure of GR-S increases the need of some criteria of cure rate in this polymer, and simpler methods are always desirable for natural rubber.

In this paper some semi-quantitative methods for evaluation of rate of cure from the tensile strength-cure time curve are presented. The methods, based principally upon the ratio of the tensile strength at an undercure to optimum tensile, are in good agreement with some of the established methods for determining rate of cure in both natural rubber and GR-S. Data are presented comparing the proposed methods with some of the accepted criteria of rate of cure in both natural rubber and GR-S tread compounds containing a series of pigments ranging from a coarse rapid curing whiting to a very fine, slow curing channel black. Combined sulphur, as a function of cure, is included for the GR-S stocks and is in good agreement with the suggested methods. The simplicity and rapidity of the proposed methods enhance their application to plant control work. The methods have shown excellent agreement with T-50 tests on production channel blacks in a natural rubber control test formula. L. H. Cohan and M. Steinberg, Continental Carbon Co., Chicago, Ill.

The Sulphur Linkage in Vulcanized Rubbers. I. The Reaction of Methyl Iodide with Sulphur Compounds. Methyl iodide reaction at room temperature can be used to differentiate between mercaptan, sulphide, and disulphide sulphur in anhydrous systems. Mercaptans react slowly giving hydrogen iodide. Sulphides react quantitatively in one to three days, but the

[2] *Can. J. Research*, 103-113, 20B (1942).
[3] "Decomposition of Benzoyl Peroxide on Carbon Black", paper presented at the A. C. S. meeting in Pittsburgh, Pa., on Sept. 7.

product depends on the type of residue on the sulphur atom. Disulphides react very slowly. In so doing, the sulphur to sulphur link is ruptured with liberation of free iodine. Mercuric iodide catalyzes the sulphide and disulphide reactions, making the former quantitative in one hour and the latter in three days. Pale crepe rubber or GR-S does not interfere chemically with the reactions, which are presented with a view to their use in the determination of the sulphur link in vulcanizates.

II. The Reaction of Methyl Iodide with Vulcanizates. The dispersion of vulcanized rubber in solvents which do not attack the sulphur bonds is dependent on the presence of oxygen. The reaction of methyl iodide with vulcanizates at 24° C. leads to the removal of part of the combined sulphur as trimethyl sulphonium iodide. Evidence is presented that the sulphur so removed is sulphide sulphur linked to the α methylene carbon atom of the rubber polyisoprene chain. In the case of well-cured gum rubber stocks the less the quantity of methyl iodide-removable sulphur present, the higher the tensile strength. Upon overcure occurs conversion, of non-removable to removable sulphur, while the sulphur which combined on overcure is completely removable. Complete devulcanization can be achieved with methyl iodide at 100° C. The nature of the devulcanized product depends on reaction time and catalysts. The sulphur linkages in a GR-S gum stock apparently do not differ chemically from those present in a pale crepe gum stock. M. L. Selker and A. R. Kemp, Bell Laboratories.

The Heat Resistance of GR-S. Investigation of the heat aging of GR-S vulcanizates has demonstrated that not only do different types of changes take place in GR-S than in rubber when vulcanizates of these elastomers are heated, but also the causes of these changes differ. GR-S vulcanizates undergo the same amount of hardening, whether heated in the presence of air or in the presence of carefully purified nitrogen. This fact indicates that oxidation plays little part in the heat aging of GR-S. After-vulcanization appears to play a smaller part in causing the changes brought about by heating vulcanized GR-S than it does in the heat deterioration of vulcanized rubber. The activity of the accelerator used, or even the presence of an accelerator, has little effect on the heat aging. Low sulphur vucanizates are somewhat superior to those in which greater amounts of sulphur are used, but no outstanding improvement is thus obtained. From these observations it appears that most of the effects observed when GR-S vulcanizates are heat aged are due to an instability of the polymer or vulcanized polymer which allows further polymerization or cross-linking to take place. The deterioration of GR-S vulcanizates by heat can be greatly reduced by the use of an entirely different method of vulcanization. Aromatic polynitro compounds, particularly dinitrobenzene, have been found to give good vulcanizates with GR-S whose stress-strain and tear properties are very similar to those of sulphur vulcanizates. The heat resistance of the dinitrobenzene vulcanizates is considerably superior; the retention of elongation after four days in a 100° C. air oven is from 65-70% compared with less than 50% for most sulphur vulcanizates. This heat resistance is apparent both in heavily loaded and lightly loaded GR-S stocks. Although the conventional methods used in rubber have failed to impart the desired heat resistance to GR-S vulcanizates, the use of dinitrobenzene as a vulcanizing agent has pointed a way toward the solution of this problem. B. M. Sturgis, A. A. Baum, and J. R. Vincent, du Pont.

Butaprene NF: A New Cold Resistant Synthetic Rubber. Butaprene NF, a new oil-resisting synthetic rubber with excellent flexibility at low temperature, is discussed, and data are presented showing the effect of several compounding variables on certain of its properties. The effects of varying the stearic acid, zinc oxide, magnesium oxide, lead oxide, and sulphur concentrations; types and concentrations of accelerators, fillers, and softeners; and time of cure are reported. Special emphasis is placed on the effect of these variations on cold resistance, but data are also included to illustrate their effect on tensile strength (before and after even aging), compression set, resilience, and resistance to swelling in gasoline with high aromatic content. Typical compounds having superior resistance to low temperatures are reported. R. H. Crossley and C. G. Cashion, Xylos Rubber Co., Akron.

Compounding Study of Channel Black and M. R. in GR-S. M. R. (mineral rubber) is one of the oldest and most extensively used compounding ingredients for natural rubber and reclaim, being used as a softener, dispersing agent, filler, or extender in a wide variety of products. In GR-S, the use of M. R. has certain advantages in addition to those mentioned above. It imparts to a GR-S compound greater tensile strength, greater resistance to tear, and increased resistance to growth of cracks due to flexing. This paper presents data showing the effect of M. R. on these physical properties. The data are presented by the method of "trilinear compounding" proposed by D. B. Forman.[4] The effects on physical properties of variations in GR-S base compound, channel black, and M. R. within the following ranges are shown by this method.

	% by Volume		
GR-S base	100	65	40
Channel black	0	to 35	to 20
M. R.	0	0	40

By examination of the graphs it is possible to select the proper amounts of channel black and M. R. to use to obtain the highest tensile strength, greatest resistance to tear, and the greatest resistance to flex crack growth. The modulus and hardness of each compound are also shown. H. F. Schwarz, Wishnick-Tumpeer, Inc., Chicago.

Effect of Variable Sulphur Accelerator Levels on Properties of GR-S Tread Stocks. GR-S tread compounds containing 0.50, 0.75, 1.00, 1.25, 1.50, 2.00, and 4.00 parts of sulphur per hundred parts of GR-S each with low, normal and high acceleration of (1) Altax and (2) Santocure have been prepared using both EPC black, and high-modulus thermal black. Nine properties (modulus, tensile, elongation, permanent set, hardness, flex crack growth, resilience, heat build-up, and abrasion loss) and the effect of heat aging upon certain of these properties have been studied over a range of cures. The various sulphur levels are compared at optimum acceleration with respect to the different properties investigated. L. R. Sperberg, Phillips Petroleum Co., Bartlesville, Okla.

Effect of Time and Temperature of Cure on the Properties of GR-S Tread Stocks. I. The properties of tread compounds with one, two, and three PHR of sulphur each with three ratios of Captax-DPG have been measured over a range of cures at 260, 280, and 300° F. The data indicate that: (1) the inflection point in the modulus-time curve is a good measure of comparative state of cure; (2) equivalent cures at different temperatures (260-300° F.) give the same properties; (3) with the accelerator range used, these compounds were more sensitive to changes in the sulphur ratio than to changes in the accelerator ratio; and (4) a faster rate of cure than anticipated was observed in the thick specimens used for the hysteresis tests. This latter observation was further checked by curing slabs in thicknesses from $^1/_{16}$-inch to 2½ inches at varying times and measuring the properties at the center of the slab. The development of equivalent states of cure at various thicknesses is much faster than for natural rubber.

II. Cures and tests similar to those in Part I were run on a series of tread stocks accelerated with Monex and others cured with Tuads without added sulphur. The conclusions arrived at in Part I also apply to these compounds. In addition (1) the "flat curing" characteristics of Monex accelerated stocks are thought to be due to the more rapid rate of sulphur combination so that virtually all the available sulphur is combined at the optimum cure; (2) Tuads cured stocks show an advantage over Captax-DPG and Monex accelerated sulphur stocks in resistance to crack growth at higher levels of hysteresis; (3) aging tests run on this series indicate that the rate of deterioration, as judged by increase in modulus and decrease in elongation, is doubled by a rise in the aging temperature of 18° F. A. E. Juve and B. S. Garvey, Jr., B. F. Goodrich Co., Akron.

Tread Cracking of Natural and Synthetic Rubber Stocks. A laboratory tread cracking machine employing a grooved test piece and providing, in the flexing cycle, tension (21.5, 30.0, 44.5, 64.5, or 93.0%), compression (43%), and bending in the base of the groove is described. The similarity in flexing action between the machine and tires in service is discussed. Test samples may be cured in a special mold or obtained from the tread of a cured tire. Either tests of crack initiation (normal samples) or crack growth (precut samples) may be conducted. The relative merits of measuring the amount of cracking in a given flexing time and measuring the time necessary to crack a given

[4] *Rubber Age (N. Y.)*, 50, 191 (1941).

amount are given. A series of groove cracking tests is presented of blends of *Hevea*-GR-S, guayule-GR-S, reclaim-GR-S, and *Hevea*-reclaim in tread stocks. The *Hevea*-reclaim stocks are shown to decrease in flexing life with increase in reclaim for both crack initiation and crack growth. In the crack initiation tests the *Hevea*-GR-S, guayule-GR-S, and reclaim-GR-S stocks are shown to increase in cracking resistance with increase in GR-S; in crack growth tests to decrease. Crack growth tests of a series of cures of *Hevea* and GR-S are compared with tensile strength measurements. For both stocks the cure for optimum cracking life is shown to be less than the cure for optimum tensile strength. Irven B. Prettyman, Firestone.

Buna S for Wire Insulation. This report gives the results of an investigation undertaken to determine some of the basic information required to aid in the application of Buna S as insulation on wires and cables. The results reported include comparisons of moisture absorption, electrical properties, and compounding characteristics of Buna S with those of rubber. Electrical stability in water is related to chemical analyses. Data are also presented on vulcanization, rate of sulphur combination as related to development of tensile properties, and effect of additions of organic and inorganic fillers on physical and electrical characteristics. It is shown that unvulcanized Buna S is somewhat inferior to milled smoked sheets with respect to dielectric properties and electrical stability in water, but that the vulcanized pure gum compounds compare favorably in both respects.

The power required and temperatures attained in the laboratory Banbury mixing of insulating compounds with nine different samples of Buna S and a natural rubber compound as control showed little variation. The Williams plasticity also showed little variation, but no inference is made with respect to comparative extruding characteristics. Tensile strength of the Buna test compounds varied from 62 to 85 kg/cm^2 as compared with 182 kg/cm^2 for the rubber compound control. Time to attain technical cures at 134.5° C. also varied from 15 to 30 minutes for the Buna compounds as compared to 20 minutes for the rubber compound.

The brittleness temperatures of the compounds made with Buna S containing 20 to 25% styrene varied from –43 to –48° C. as compared with –50° C. for the rubber compound. Compounds made with Buna S of 37 and 44% styrene content gave brittleness temperatures of –27 and –10° C., respectively.

The moisture absorption, electrical characteristics, and electrical stability of the nine Buna insulating compounds in distilled water at 25° C. for one month compared favorably with the values obtained for the rubber compound. Ash, water solubles, soap content, and conductivity of a water extract of the ash showed correlation with electrical stability and water absorption.

The rate of vulcanization increased with increased sulphur content. Sulphur combines at a constant rate until a substantial portion of that present is combined. The amount of sulphur which combines in a given time depends on the concentration. The temperature coefficient of vulcanization, as determined by combination of sulphur over the range of 134.5 to 155.4° C., was 2.07 per 10° C. It was somewhat lower than has been found for natural rubber as determined by physical properties.

Unlike rubber, substantial additions of gilsonite or blown asphalt to Buna S improve the tensile properties. The compression cutting resistance of Buna S compounds on wires are in the same range as those obtained with similar rubber compounds when tests are made at 25° C., but at 80° C. the values obtained with Buna S are considerably lower than those obtained with rubber.

The tensile properties of Buna S are deteriorated to a lesser extent on accelerated aging than are those of similar rubber compounds; however the brittleness temperature is raised to a greater extent. The compression cutting resistance of Buna S compounds increases as a result of accelerated aging in air at 100° C. for a few days; while that of rubber decreases. Tests made at 80° C. show an advantage for the Buna insulation over rubber after aging in air at 100° C. J. H. Ingmanson, J. B. Howard, V. T. Wallder, and A. R. Kemp, Bell Laboratories.

The Sunlight Resistance of Hycar-OR Compounds. Compounding research with Hycar OR-15 and Hycar OR-25 showed that certain vulcanized compounds are highly resistant to sunlight. Oily materials as wool grease or Vistac, which bleed to give protective surface film, afforded moderate sunlight protection. Waxes which bloom to the surface gave protection comparable to the effect in natural rubber. Of these tested refined paraffin was most effective. Stocks in which part of the Hycar-OR was replaced, as with 50% Neoprene-GN or 75% "Thiokol"-FA, showed good sunlight resistance. The results of the tests in sunlight and in ozone gave good correlation. B. S. Garvey, Jr., and R. A. Emmett, Goodrich.

The Evaluation of Low Temperature Properties of Several Synthetic Rubbers in Aviation Fuels Using the Dyne Tensiometer. A new improved method for evaluating increasing modulus of rubber stocks with decreasing temperature has been used in sharply defining the freeze resistant characteristics of important synthetic rubbers. The method is based upon a precise and accurate measurement of increasing stiffness through use of a dyne tensiometer. A small sample clamped immovably at one end acts as a cantilever beam as it is flexed through a specified angle and distance. The tensiometer, sensitive to slight increments in stiffness, permits a direct reading of the force required to bend the sample. Data, secured at arbitrarily chosen temperatures, can be plotted graphically to indicate clearly the relation of stiffness to temperature. Utilizing this method of evaluation, an analysis has been made on the effect of various aviation fuels on synthetic rubbers commonly applied where fuel and extreme low temperature resistance are required. Test conditions are established which duplicate many operating conditions in today's aviation. Apart from determining comparative freeze resistant qualities in an air medium of the unextracted synthetic compounds, each compound is extracted in aviation fuels for 168 hours and again compared, both in an air chamber and immersed in each fuel. The data amply prove that no synthetic rubber can be assumed resistant to all types of fuels. The basic differences of various types of synthetic elastomers (Perbunan, Hycar OR-15 and Hycar OR-25, and Neoprene FR and GN) are quantitatively compared, before and after fuel immersion. It is demonstrated that heavy plasticization, commonly used to secure low temperature flexibility, is valueless where effective extraction by fuels occurs. R. G. Chollar, C. J. Wilson, and B. K. Green, National Cash Register Co., Dayton, O.

Resistance of GR-S Vulcanizates to Various Types of Aging. Data are presented showing the effect of various types of accelerated aging on a simple GR-S vulcanizate. The type of aging tests studied are the oxygen pressure test, the air oven test at 121° C., and the air pressure heat test at 127° C. and 80 pounds per square inch of air pressure. Results on tests of a typical smoked sheet vulcanizate in the same tests are included. The importance in GR-S vulcanizates of evaluating the effect of accelerated aging on properties other than tensile strength is stressed. Particular attention is paid to the effect of these accelerated aging tests on modulus, elongation at break, tear resistance, hardness and dynamic properties. Data are presented showing the effect of small amounts of copper and manganese on the age resistance of GR-S vulcanizates as determined by the oxygen pressure test. It is shown that these metals are much less severe in their catalytic effect on the oxidation of GR-S than they are on natural rubber. A few tests are included showing the effect of simultaneously increasing the accelerator and decreasing the sulphur on the resistance of GR-S vulcanizates to each of the types of accelerated aging. A table showing the approximate comparison of the severity of the various types of accelerated aging tests on GR-S vulcanizates with respect to changes in tensile strength, elongation at break, and modulus is presented. A. M. Neal and P. Ottenhoff, du Pont.

Young's Modulus and Brittleness of Natural and Synthetic Elastomers at Low Temperatures. The literature on the subject of low temperature serviceability of elastomers is reviewed. It is pointed out that neither brittleness nor modulus data separately suffice as low temperature indices of serviceability. A method for determining Young's modulus in bending is described. The design of the apparatus is such that observations can be made on a fairly large number of samples subjected to identical "cold treatment." The data presented show the change in modulus as a function of temperature in the range 0 to —60° C. (+32 to —75° F.). Brittleness data (obtained by a technique similar to that described

by Selker, Winspear and Kemp[3] are also presented for the same stocks. The stocks chosen in this study were not designed specifically for low temperature application, but rather with the object of obtaining the characteristics of the base elastomer in a typical gum or tread stock. The elastomers studied include natural (*Hevea*) rubber, GR-S, Butaprene N, Neoprene GN and FR, butadiene-styrene type of polymers having different percentages of butadiene and styrene, Butyl, and Butaprene NF. Only those physical effects resulting from second order translations are considered in the present work. The distinctions between true crystallization effects (long time) and second order transition effects (short time) are briefly discussed. John W. Liska, Firestone.

A Method of Measuring Low Temperature Modulus Change in Vulcanized Elastomers. A method of measuring low temperature modulus change by means of the per cent retained elongation under constant load conditions is described. The instrument developed for this purpose consists of a telescopic arrangement of sleeves supporting T-50 type specimens. One sleeve is fixed; while the other is free to move under applied load. This displacement is measurable and represents elongation of the specimen. The determinations are carried out in a cooled ethyl alcohol medium. Temperature range employed in this work has been +20 to —55° C. The relation between the elongation values obtained at room temperature and those obtained over a range of low temperatures can be expressed in terms of estimated modulus change. The reproducibility of data obtained by use of this instrument is considered adequate. Factors affecting low temperature measurements, such as the rate of cooling and rate of extension of the specimen, have been studied in relation to the technique proposed. By a proper application of the method it is possible to characterize those factors influencing loss of elasticity in vulcanizates at low temperatures. Data are presented on the relative efficiency of some plasticizers in Perbunan, with some interesting observations on the influence of a soft coal tar product with respect to low temperature change. The degree of vulcanization in GR-I vulcanizates is shown to be a critical factor in resisting loss of elasticity over a range of low temperatures. Some data are also presented on general purpose elastomers in pure gum, tire tread, and carcass types of compounds. D. J. Buckley and A. L. Chaney, Standard Oil Co. of Louisiana, Baton Rouge, La.

A New Apparatus for Determining Hardness and Creep of GR-S and Rubber Compounds at Various Temperatures. The present methods of determining hardness by a penetrating ball or needle-type apparatus are not easily applicable at high or low temperatures. We propose to determine hardness and creep on an apparatus, created in our laboratory, which is based on the measurement of modulus of elasticity at slight deformations. Data taken on 13 different GR-S compounds and one rubber compound, at temperatures from —50 to +100° C., give evidence that there is a straight line relation between hardness, as determined on the penetrating-type instruments, and the modulus at low elongations, as determined on the new apparatus. The data show that this method may be applied on very soft or very hard materials. The apparatus consists of a lever arm with a ring placed on one end, and an adjustable weight on the other side of the fulcrum. On the ring side is a magazine which may hold up to 150 rings. The weight side moves against a scale which shows the relative deviation of the ring. The entire apparatus is enclosed in an insulated box, which may be controlled at any desired temperature. The rings (1½ inches O.D. by ½ inch I.D.) are cut with a rotating cutter from ¼-inch sheet of stock used for abrasion, rebound, and ring tensile tests. The magazine is used to change the rings, and the entire apparatus is operated without opening the box. Investigations were made on the relation between the new test and other physical properties for various loadings of different materials. J. A. Talalay and R. E. Gladstone, Converse Rubber Co., Malden, Mass.

[3] *Ind. Eng., Chem.*, 34, 137 (1942).

On the Influence of Electric Fields on Rubber Latex. A.C. and three-phase fields were applied to natural rubber latex. In each case the formation of chains was observed, which disintegrated after the fields were switched off, thus exhibiting the reversible character of the aggregation. A peculiar aggregation of the chains themselves also took place. Those phenomena have general significance. The formation of the chains is most likely due to a polarization by the applied field of the electrically charged latex particles. This leads to a competition between Brownian motion and electric field and causes a chain formation if the influence of the latter is stronger. The aggregation caused by an electric field is somewhat similar to the reversible aggregation of latex particles by a creaming agent. This specific effect of the electric field should act for instance in electro-decantation in addition to electrophoresis and gravitation. The influence of D.C., A.C., and three-phase fields on creaming of latex was studied in dependency upon various factors. Eugene Guth, University of Notre Dame, and I Walerstein, Purdue University.

Carbon Black Surface Chemistry on Reenforcement of Butyl Polymers. R. S. Zapp, Standard Oil Development Co.

A.S.T.M. on New Rubber and Plastics Standards

FURTHER important actions on standards were taken by Committee E-10 on Standards at its meeting August 30 at headquarters of the American Society for Testing Materials, 260 S. Broad St., Philadelphia, Pa. On August 13, Committee E-10 by letter action accepted two new emergency specifications covering insulated wire and cable, ES-33 and ES-34. These standards were expedited by Committee D-11 since a limitation order effective after August 15 would have prevented the use of crude rubber in the manufacture of insulation or jacket compounds, and synthetic and reclaimed rubber had to replace crude rubber for these particular requirements. Earlier, Committee D-11 had developed emergency specifications for chloroprene sheath compound (ES-28 and ES-30) and at the June annual meeting, new specifications for polyvinyl insulating compound (D 734) were approved. The latest specifications, which permit the use of GR-S, are now available for industry guidance and performance references in connection with WPB orders.

While other A.S.T.M. specifications are being continued as references in WPB order R-1, they are for certain uses of the Armed Forces only. Prompt development of these standards was handled through D-11's Subcommittee V on Insulated Wire and Cable headed by R. A. Schatzel, also chairman of the Technical Advisory Committee, Rubber Director's Office, WPB. In each specification the insulation must have a minimum tensile strength of 700 psi. and elongation at rupture of 300% minimum. The performance compound (ES-34) must not show depreciation in tensile strength and elongation of more than 35% after 96 hours in the oxygen bomb; while the heat resisting compound (ES-33) must not show more than 50% depreciation after 20 hours air pressure heat test or after 168 hours at 80° C. in the oxygen bomb.

The latest in the series of important specifications and tests for plastics developed through the intensive work of Committee D-20 covers so-called non-rigid type of plastics. The six tentative standards approved by Committee E-10 cover the following: Non-Rigid Polyvinyl Chloride-Acetate Plastics (D 742 - 43T); Non-Rigid Ethyl Cellulose Plastics (D 743 - 43 T); Non-Rigid Polyvinyl Chloride Plastics (D 744 - 43 T); Non-Rigid Polyvinyl Butyral Plastics (D 745 - 43 T); Tentative Method of Test for Stiffness in Flexure of Non-Rigid Plastics (D 747 - 43 T); Tentative Method of Test for Brittleness of Non-Rigid Plastics (D 746 - 43 T).

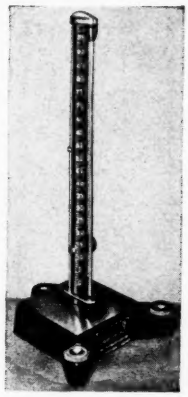
Besides these new tentative standards, there were approved several modifications in specifications approved earlier this year. In the case of Polystyrene Molding Compounds (D 703) a new Type 3 material has been added, a general purpose molding material characterized by superior heat-resistant qualities.

The new specification for polyvinyl chloride (D 742) covers two types of transparent and opaque material which have approximately 95% vinyl chloride content. Type 1 is unfilled; while Type 2 contains an inert filler. There are five grades of material. Type 1 has tensile strength ranges from 1000 to 3000 psi., and the three grades in Type 2 have a tensile range of 600 to 1200 psi. Various properties are specified which can be determined according to A. S. T. M. tests that are cited, including the two new tests for stiff-

(Continued on page 76)

New Machines and Appliances

Industrial Thermometer of New Design



New Instrument to Measure Resiliency

New Industrial Thermometer

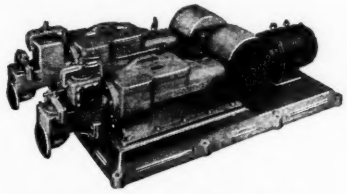
TO SAVE critical metals in wartime, a new industrial thermometer has been designed and tested in the field and is now being introduced to the industry. The one-piece case is more shallow, making it possible to see the mercury column through a wider angle of vision. The chromium-plated bezel fits snugly into the grooved case in such a way as to hold the thick glass front securely against four wavy tension springs, which are fastened securely under the scale by shakeproof screws. This construction results in a dustproof, rattleproof, and practically fumeproof thermometer and one which can withstand vibration and severe shocks. These improvements combine permanent accuracy, responsiveness to change in temperature, durability, and a saving of tons of critical bronze. The new instruments will be equipped with easy-reading Binoc tubing. They will be furnished in many combinations of straight and angle stems, with threaded or union connections, and in many standard temperature ranges, within the limits of —40° F. to +750° F. Standard scale lengths are seven and nine inches. Numerals are bold and clear, standing out sharply against a contrasting background. Taylor Instrument Cos., Rochester 1, N. Y.

Improved Resiliometer

AN IMPROVED instrument for measuring the resiliency of rubber and extensible plastic compounds by indicating the rebound of a weighted plunger dropped from a predetermined height has been announced. Resiliency determinations are important in compound development, for measuring rate and state of cure; matching competitive compounds; factory control tests on cured samples of mixed batches; and for quality tests of the finished product without destroying the product. This value may also be used indirectly for comparing heat build-up of various compounds and for measuring plasticity of uncured compounds and masticated rubber. The instrument formerly known as the Bashore resiliometer and recently sold by the Testing Equipment Co. is now manufactured by the Precision Scientific Co.

Proportioning Pumps for Latex

NEW large-size proportioning pumps for handling regular and off-grade latices, as well as many other viscous fluids, have been announced. These pumps, designated as the 4X Series Adjust-O-Feeders by the manufacturer, were developed from data obtained on field tests as well as from engineering requirements for fluids of this type. The new design includes a special double stuffing gland



Proportioning Pump for Latex

containing metallic stripper rings for keeping the latex out of the packing. The stripper rings are held in close contact with the steel plunger, and the front ring has a cutting edge which removes adhered latex rubber during the suction stroke. Provisions are made for continuous washing of the plunger and the back of the stripper rings by a stream of water under pressure to carry away the small amount of rubber which may build up with conseqent balling in the packing. Large easily removable inspection ports with hand clamps provide for quick and easy inspection of the 3½-inch diameter ball check valves without the use of special tools.

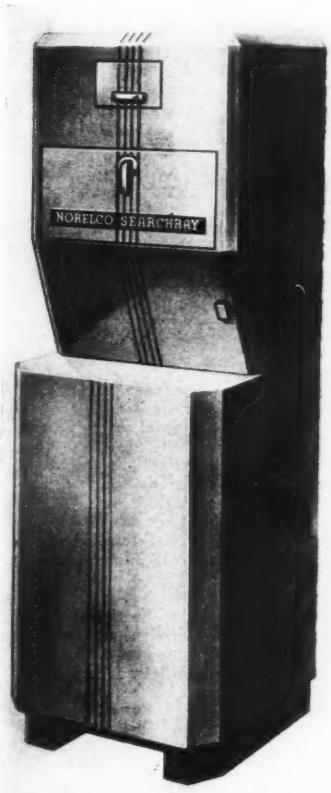
The drive motor and the speed reduced are separate units, permitting the individual removal of either in the event that repair or reconditioning is necessary. The driving crank is equipped with a micrometer stroke adjustment, allowing displacement regulation to one part in 400. A stroke indicator scale is mounted on the crosshead frame, and a pointer attached to the crosshead shows actual plunger displacement to the operator at all times. These pumps are available in both Simplex or Duplex construction and in sizes up to and including 30 gpm at 40 rpm. % Proportioneers, Inc. %.

New X-Ray Inspection Unit

A NEW, simple, compact X-ray unit which can be operated safely by unskilled personnel for any condition for which this type of inspection is desired was recently announced. This electronic unit, called Searchray, is both fluoroscopic and radiographic in action and provides a quick, simple means for the non-destructive internal inspection of small parts, molds, ceramics, plastics, and rubber, assemblies and semi-finished and finished products. Installation and operation are easily accomplished. There is no intricate system of dials or controls to adjust. The operator simply plugs into any standard 110-volt power supply, places object in the compartment, closes the door, and presses the button. The object can then be instantly seen fluoroscopically through the eye-piece. Safety for the operator is assured by a rayproof, shockproof housing with full automatic electric interlocks which interrupt the circuit while the compartment door is open.

Searchray is applied with accessories which permit radiographic examination covering a maximum area of 11 by 14 inches using standard 12- by 14-inch X-ray film or paper. The article compartment is 21 inches long by 18 inches deep by 9 inches high. The fluoroscopic screen measures 12 by 18 inches with 8½ by 11½ inches being the maximum area ob-

(*Continued on page 80*)



New Electronic Searchray Unit

UNITED STATES

Jeffers Resigns; Dewey Now Rubber Director, Rubber Program Enters New Phase

An important event, and one which serves to emphasize the end of the first phase of the wartime rubber program, occurred early in September with the resignation of William M. Jeffers as Rubber Director and the naming of Col. Bradley Dewey as Acting Rubber Director. Colonel Dewey, who as Deputy Rubber Director under Jeffers, had been directing the technical part of the program, was named Director on September 15 by Donald M. Nelson, chairman of the War Production Board. Mr. Jeffers in his letter of resignation to the President said that "the big job" of the rubber program had been completed and that "the greatest contribution I can make in the present emergency is to return to the on-the-job handling of the operations of the Union Pacific Railroad." The President in reply praised Jeffers for performing a "real public service" as Rubber Director and wrote that "much as I dislike to have you leave the public service at this time, I cannot ask you to make a further sacrifice." Also in his letter to the President, Jeffers summed up the present situation by saying:

"The problem of taking care of the requirements of the armed forces and keeping the country on rubber, meanwhile conserving the nation's stockpile of natural crude, is well in hand, though there is at present a prospective shortage of tire fabric which is the responsibility of the War Production Board. All of the major synthetic rubber plants, the construction of which is under the jurisdiction of the Office of the Rubber Director, are either completed or substantially so, with the exception of three."

Dewey Discusses Present and Future Plans

In a talk before the American Chemical Society fall meeting in Pittsburgh on September 8, Colonel Dewey reviewed the present status of the rubber program and showed typical photographs of some of the synthetic plants together with flow sheets of the so-called "standard" GR-S plants. He stated that slightly over 50% of the rated capacity of butadiene was finished and ready for operation, 80% of the styrene, 90% of the copolymer, 35% of the butyl, and 100% of the neoprene capacity. All the plants should be finished before the end of the year, he said. During the first half of the year it was revealed that 38,400 tons of synthetic rubber were made and the production of all synthetics for September would be in excess of 30,000 tons. Colonel Dewey mentioned the plans for providing essential drivers with tires for this year and next and complimented the reclaim industry on the job it had done between February and June of this year in raising the production of camelback from 6,000,000 to 20,000,000 pounds a month. With the replacement of Grade F camelback with Grade C containing 40% GR-S on October first, he declared the recapping program will carry through for a long time to come, with every effort being made to recap up to 2,500,000 tires per month. Even if the proposed production of 30,000,000 new synthetic rubber tires in 1944 is realized, the speaker cautioned against the public interpreting this as meaning unrestricted driving in 1944 and 1945 since it represented only about 1½ new tires per car from Pearl Harbor to the end of 1944.

Although the spectre of collapse from a shortage of rubber is gone, and, if other components are provided in sufficient volume, there will be sufficient tires to meet essential needs, it was emphasized that lower costs and better quality can and must be realized. The present mileage of heavy-duty truck and bus tires containing 10 to 30% natural rubbers was reported as 15,000 miles. The new Rubber Director paid tribute to the cooperative research that had made the success of the program up to the present time possible. He said that to encourage research on the future synthetic rubbers, the Office of the Rubber Director is planning an enlarged program of research and as a part of this is building in Akron a laboratory for the evaluation of new modifications and a pilot plant for the manufacture of semi-commercial lots of those rubbers which appear most promising. As for the postwar, it was pointed out that it was up to the chemists as Americans to see to it that the synthetic rubber industry earns a place without artificial help as a permanent source of part of the rubber used in peacetime.

Chicago Tribune Reports on Buna S Road Tests

In a series of newspaper articles during the month, Hal Foust, of the *Chicago Tribune*, reported the results of road tests on Buna S passenger-car and light truck tires which indicated probable mileages of 27,208 at 35 m.p.h., 24,930 at 45 m.p.h., and 15,027 at 50 m.p.h. after driving a 1,000 miles or more on smoothed surfaced roads throughout the Midwest. Don C. Waugh, a technician loaned to the test project by the Goodyear Tire & Rubber Co., was cooperating with Foust in some of these tests, and this technician warned that these mileage figures should not be compared without qualifications with motorists' experiences with prewar natural rubber tires. The Buna S used for these tires was the same as that made to government specifications, differing only as to the source of butadiene, which was made from alcohol from the *Tribune's* sulphite liquor plant.

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Bradley Dewey

Expansion of Guayu'e Production Urged

The growing shortage of natural rubber which is still required for the manufacture of heavy-duty tires should be alleviated by accelerating the government program for the production of guayule, according to a statement by William O'Neil, president of The General Tire & Rubber Co., early in September. Experiments made by the Forest Service indicate that a one-year harvest of guayule is possible and a two-year harvest could be expected, and Mr. O'Neil stated that a large portion of the original government guayule project should be carried out in Mexico, where there is an abundance of labor and where there are hundreds of thousands of acres of irrigable land.

Cartel Issue Flares up Again

Ralph W. Gallagher, president of the Standard Oil Co. of New Jersey, issued a statement on September 14 in reply to a speech made by Vice President Wallace in Chicago on September 11, since the oil company president said that the attack by Wallace on international cartels was directed at his company by implication. In this statement Mr. Gallagher said that if cartels are to become a political issue, he wanted to make the position of his company clear. He then went on to say that Standard did not believe in controlling production; it did not believe in combinations to control prices except in wartimes; it was in favor of business dealings with people

CALENDAR

Oct. 1-2.	A.S.M.E.-Engineering Institute of Canada. Joint Meeting. Royal York Hotel, Toronto, Ont., Canada.
Oct. 3-9.	Fire Prevention Week.
Oct. 5-7.	Rubber Division, A. C. S., Fall Meeting. Commodore Hotel, New York, N. Y.
Oct. 5-7.	National Safety Council. 32nd National Safety Congress and Exposition, Chicago, Ill.
Oct. 8.	Rubber & Plastics Division, Montreal Section, S. C. I.
Oct. 15.	Chicago Rubber Group, A. C. S. Morrison Hotel, Chicago, Ill.
Oct. 22.	Boston Rubber Group, A. C. S. Parker House, Boston, Mass.
Nov. 5.	Akron Rubber Group, A. C. S.
Nov. 12.	Rubber & Plastics Division, Montreal Section, S. C. I.
Dec. 6-11.	Nineteenth Exposition of Chemical Industries. Madison Square Garden, New York, N. Y.

in foreign countries, and it was against secret agreements. He further stated that the company believed that the judgment of the American public has been consistently right when it has the facts, and that his company was ready to file with the proper government agency copies of all contracts made with foreign corporations. If that agency considers publication of the facts to be in the public interest, Standard is publishing them to the world, he said.

Vice President Wallace then issued a statement in which he did not directly reply to Mr. Gallagher's published remarks, but took issue with him on an earlier comment in which Mr. Gallagher had said that Wallace should certainly know that Standard Oil long before the war worked with eight agencies of our government to establish synthetic rubber production in this country. The Vice President presented portions of correspondence and documents from Standard's files during 1938, 1939, and 1940 to show that cooperation with the government, in his opinion, left much to be desired and was influenced by Standard's cartel agreement with I. G.

It was indicated in the middle of the month that an increased amount of butadiene may be made from industrial alcohol in order to permit an equivalent amount of butylene to be used to meet the increasing demands for aviation gasoline. Based on a request for additional industrial alcohol from Rubber Director Dewey, the WPB advised the Alcohol Industry Avisory Committee that no distillation for beverage purposes would be permitted this year.

Tire Expansion Program May Not Be Settled

Judging from statements made by various rubber company executives late in the month and the fact that leading members of the tire and rubber industry met with Rubber Director Dewey and WPB Vice Chairman Charles E. Wilson on September 22 to discuss manpower conditions and production in the two principal manufacturing centers of Los Angeles and Akron, the decision that the 30,000,000 tires could be made in existing plants, if additional machinery were installed, is not agreed with in all quarters. Collyer of Goodrich, Thomas of Goodyear, and O'Neil of General Tire, all expressed the opinion in published statements that unless additional manpower and equipment were provided, the tire industry might not be able to meet the goal of 30,000,000 tires for civilians for 1944 which had been set by the Rubber Director's Office. In preparation for civilian tire production Goodyear is already planning to move some of its military production such as self-sealing airplane fuel tanks away from Akron and into communities which have a less critical manpower situation.

Concerning the meeting of tire manufacturers and the WPB, it was reported that facts and figures relative to the general tire and rubber picture were discussed but no decisions were made at this meeting. The data submitted will be studied by the Office of the Rubber Director and the WPB to determine what future action will be taken in present manufacturing locations to assist the industry in manufacturing their quotas of tires and other fabricated rubber goods essential to the war.

A later announcement on September 24 by the Office of the Rubber Director stated that the program for new facilities has been reduced from its originally contemplated total of more than $95,000,000 to less than $70,000,000 and that it now calls for the construction of only two relatively small new plants. This reduction has been made possible by the "splendid cooperation" of labor with industry and by the staffs of the WPB and the Army, Colonel Dewey said. The Army is returning certain plants formerly used for Ordnance purposes to their owners; expansion of certain present plants has been carefully adjusted to take into consideration the presently available trained labor and the maximum existing capacity; and facilities in critical labor area have been adjusted to use experienced rubber workers heretofore employed in other work.

Tompkins Deputy Rubber Director

Colonel Dewey also announced on September 24 the appointment of L. D. Tompkins as Deputy Rubber Director. Mr. Tompkins will continue in charge of the Operations Division in addition to his duties as Deputy Director. At the same time E. B. Babcock was named Assistant Rubber Director in charge of product development and conversions; Frank Creedon as assistant rubber director in charge of construction; and E. R. Gilliland as assistant rubber director in charge of research and development. All of these men have been with the Office of the Rubber Director since 1942 and had been assistant rubber directors under the former Rubber Director.

Tire Cord Program Again Attacked by Truman Committee

In reopening hearings on the rayon-cotton controversy, Southern Senators of the Truman Committee asserted that the Government was helping finance rayon expansion to the displacement of cotton. In a letter to this Committee, Chairman Donald Nelson of the WPB stated that the 1944 tire program threatens to be seriously retarded by inadequate supplies of both rayon and cotton cord.

Office of Defense Transportation, Washington, D. C., by Special Order ODT R-6, taken in cooperation with the WPB and effective September 20, approved a plan for the pooling of all privately owned covered hopper cars used to transport carbon black. This plan was instituted to get more efficient utilization of the specially built carbon black cars and to free some for use by other industries, although such use is greatly limited owing to the cars' lightweight construction and other features. At present the carbon black cars are leased by the owners to the consumer trade. Under the ODT plan all cars now in use in the industry will be leased to a Pool Authority set up by the industry. The Pool Authority, in turn, will sub-lease the cars to a carbon black producer or to a bulk consumer under terms and conditions satisfactory to the car owners. But any such sub-lease must specify that the Pool Authority shall reserve the right to limit the time such cars, empty or loaded, may be detained on the producer's tracks. The Pool Authority will assign each carbon black producer, as nearly as possible from the producer's own cars, the number of cars he will require each calendar month. Excess cars shall be subject to diversion by the Pool Authority to other carbon black shippers or to shippers of other commodities under terms acceptable to the car owner. The Pool Authority shall not exercise control over the routing of cars engaged in the carbon black service. Car owners must furnish the Pool Authority duplicate records of their car operations at such intervals as the Authority may designate, and the latter will make such reports showing the use and operation of the cars in the pool as the director of ODT's Division of Railway Transport shall direct. Communications concerning the order should refer to "Special Order ODT R-6" and should be addressed to the Division of Railway Transport, Office of Defense Transportation, Washington, D. C. Text of the order may be obtained from Room 1147, New Post Office Building, Washington 25, D. C.

The National Bureau of Standards, Washington, D. C., has announced the retirement, effective October 1, of the chief of its organic and fibrous materials division, Warren E. Emley, after more than 30 years of government service. Mr. Emley was made head of the division when it was created in 1920, and today it is engaged in research work on rubber, textiles, paper, leather, and plastics. Archibald T. McPherson, in charge of the rubber section, succeeds Mr. Emley as division chief. Lawrence A. Wood, associated with the Bureau for eight years, becomes chief of the rubber section.

Office of Economic Warfare, Office of Exports, Washington 25, D. C., in response to requests from exporters and after consultation with representatives from the automotive storage batteries industry, has established, for the last quarter this year, for certain destinations, a procedure whereby limits will be suggested to exporters beyond which applications for export licenses for such batteries are not likely to be approved. These limits are offered to exporters simply as a guide in planning their sales and export license application work. Exporters of automotive storage batteries may obtain further details by writing to the Machinery and Equipment Division, Office of Exports, Reference OE-4-4-LGG.

The United States Government is sponsoring a broad program to save such critical resources as manpower, materials, equipment, and fuels through conservation of coal, petroleum products, electricity, gas, water, communications, and transportation. This program calls for voluntary action by the public and by industry to make important savings in the domestic and commercial use of these critical resources. Although the savings in a single household, commercial establishment, or industrial plant may seem insignificant, the possible aggregate savings are tremendous.

Tire Prices and Rationing Changes by OPA

Maximum prices for synthetic rubber tires and tubes when sold by manufacturers, wholesalers, and retailers have been established and in the main, are the same as ceilings for corresponding tires and tubes of crude rubber.

At conferences with tire and tube manufacturers, OPA was told that as production costs have increased, higher ceilings should be granted for tires and tubes of synthetic rubber. However, OPA and the industry agreed that there had not been enough production experience to make possible a well-founded permanent decision, but the level of maximum prices for such tires and tubes will be reconsidered after the industry has had sufficient production experience to supply OPA with reliable cost data.

Production of synthetic tires and tubes under orders of the Office of the Rubber Director necessitates some special arrangements for their pricing which differ from those for natural rubber tires and tubes. New synthetic passenger-car tires, for example, will be made generally in one construction whose minimum specifications are given by the ORD. The ceiling assigned by OPA to this one construction in each size is the maximum price for the base level brand of the brand owner for his crude rubber tire of that size. This will be true even though the brand owner may be forced to use molds having brand names different from his base level brand. In cases where the synthetic rubber passenger-car tire is of a size formerly not on the brand owner's list in his base level brand, its ceiling price is established by a percentage relation (according to percentages given in the regulation) to the ceiling price of the 6.00-16 size in the base level brand. These percentages will give the new size a maximum price in line with the other ceilings of the brand owner.

Maximum prices for new synthetic rubber tires and tubes other than those for passenger cars are the same as the maximum price for the natural rubber tire or tube in the same type, brand, and size of each brand-owner.

This pricing action is taken by amendments to two regulations, which are effective September 9: Amendment 14 to RPS 63—Retail Prices for New Rubber Tires and Tubes—and Amendment 7 to MPR 143—Wholesale Prices for New Rubber Tires and Tubes. In both regulations an additional change extends discounts for factory seconds, which formerly applied only to passenger-car and truck tires and tubes, to all other tires and tubes as well. This is in line with past industry practice, which normally allowed discounts on seconds of all types.

Although several other changes are made in MPR 143, they do not change substantially the result obtained previously under the regulation, but provide a more precise method for achieving it. The primary pricing provisions of MPR 143 have been reworded to make them clearer and more suitable to industry practice, and also to effect some change in the method of computing maximum prices generally.

Where the seller delivered or offered for delivery new tires or tubes of the same type and brand name to a purchaser of the same class during March 1942, the regulation still fixes the maximum price for the tires and tubes on the basis of the highest prices charged by the seller to purchasers of the same class during March 1942. But a change is made, in that, where sellers sold on a discount basis, the regulation now speaks in terms of discounts rather than net prices.

In situations where the seller is delivering a new type and brand of tire or tube to his purchasers, the regulation now provides a specific formula for adjusting his maximum wholesale prices to fit the new type and brand. Such adjustment may never result in a discount of less than 25% for tires and 30% for tubes from the maximum retail prices. The same minimum discounts apply as the only method of arriving at the wholesale ceiling in any situation where the seller was not in business during March, 1942, or did not then sell tires or tubes to a purchaser of the same class.

Formerly the regulation did not fix maximum prices for some of the situations described above, or did not give them in a manner definite enough to be understood and applied readily by the trade. Now the specific discount, where applicable gives the seller a definite ceiling which insures the wholesale purchaser an adequate margin under the maximum retail price.

A new geographical applicability section is added to MPR 143 which changes the base period for Puerto Rico from March, 1942, to the period from April 10 to May 10, 1942, inclusive. The later base period is used in Puerto Rico for the General Maximum Price Regulation and has been determined to be the appropriate base period for keeping maximum prices in line with those established for the continental United States, OPA stated.

Specific maximum retail prices for additional sizes of a few brands of truck tires and tubes of eight brand-owning companies are reported in Amendment 13 to RSP 63, effective September 2, 1943, at the same levels as ceiling prices of the same sizes of similiar tires and tubes already listed for other brand-owners. Thus prices to consumers are neither raised nor lowered.

These new ceilings are given for the first time because the companies have begun only recently to produce first-line tires and tubes in the sizes given. Normally they would not offer them; therefore they were not listed for these companies on November 25, 1941, the base date in the schedule setting retail prices for new rubber tires and tubes, and could not be priced under the ordinary provisions in the schedule. Wartime conditions have caused their production by these companies, however, and the ceilings are assigned them accordingly.

At the same time OPA eliminated duplication by removing from the schedule specific maximum prices given for brands believed owned by the Cities Service Oil Co., but which really are owned by the Arkansas Fuel Oil Co. The prices given for the same brands as owned by the latter company are retained in the schedule.

Amendment 6 to RPS 66—Retreaded and Recapped Rubber Tires and Retreading and Recapping of Rubber Tires—effective September 24 establishes ceilings for recapping truck and bus tires in sizes smaller than 8.25-20 with Grade A camelback, reflecting the change from Grade C to Grade A camelback ordered by the WPB for these smaller sizes of truck tires. Although the result will be slightly higher maximum prices, the latter are more than offset by the increase in mileage resulting from the use of the better camelback.

Amendment 1, MPR 435—New Bicycle Tires and Tubes—effective September 13, makes changes in the Appendix tables covering sizes and also products of Pennsylvania Rubber Co., Inc., Jeannette, Pa.; Mansfield Tire & Rubber Co., Mansfield, O.; and Western Auto Supply Co., Los Angeles, Calif.

Amendment 5, MPR 131—Camelback—effective September 16, relates to ceilings for camelback produced by Denman Tire & Rubber Co. for Webster Rubber Co., both of Warren, O.

Several more amendments have been appended to RO 1A—Tires, Tubes, and Camelback. No. 47, effective September 2, provides recapping services and new tubes upon certificate for all commercial vehicles, regardless of the use to which they are put. Previously such services and tubes had been limited only to "essential" vehicles. The action resulted from a statement of the Rubber Director that sufficient truck-type camelback is available to fill the demands of all commercial motor vehicles, whatever their purpose. The amendment also treats of eligibility for used tires, new tubes, and recapping services to equip animal-drawn vehicles that would be eligible as commercial motor vehicles if propelled or drawn by mechanical power.

No. 48, effective August 25, removes rationing restrictions on the use of Grade "C" camelback in recapping service, following a notice by the Rubber Director that it is now possible to provide a higher-quality camelback for recapping truck and passenger-car tires because of the use of Buna S. Grade "A" camelback, formerly available for only the largest truck and bus tires, may now be obtained for recapping tires on all trucks and buses, although it is still subject to rationing. The quality of camelback for passenger cars will be improved from Grade "F" reclaimed rubber to Grade "C" synthetic stock. Previously Grade "C" had been limited to commercial-vehicle tire use. The amendment also revises its definition of "passenger-type camelback" to include both Grade "C" and "F" camelback, but "truck-type camelback" is confined to Grade "A" stock. Thus a person may have his tires recapped with Grade "F" or "C" camelback without a rationing certificate.

Amendment 49, effective August 28, covers adding tires being salvaged from government scrap heaps to the supply of used and recapped passenger tires and expedites distribution of such tires to be taken from scrap piles of the Rubber Re-

serve Co. under a plan of the Office of the Rubber Director, which calls for reexamination of scrap piles by persons designated by the Rubber Director's Office to save any passenger tires that can still give service. These tires will then be sold to dealers upon authorization of the OPA District Office. The amendment, furthermore, provides similarly for the transfer upon authorization of used passenger tires in the hands of manufacturers, who formerly could transfer such tires only in exchange for ration certificates. As previously, any tire suitable for emergency purposes, but too badly worn for recapping must be branded with an "O" and sold as "Emergency Tires" at OPA prices for such casings. Tires so branded must not be recapped; neither may the brand mark be removed. Besides all authorizations for resale of tires without certificate must now come from the District Office having jurisdiction over the area in which the tires are located instead of from the District Office of the person getting the tire. A dealer receiving any used tires upon authorization must notify his District Office, within 10 days, of the number received which are beyond use. These tires must be held for 30 days following notification, unless they are inspected and approved for disposition by an OPA tire examiner. Since tire dealers may now increase their stocks of used tires, they no longer need return to the District Office Part B of tire certificates covering used tires previously acquired upon authorization.

Amendment 2, Supplement to Revised Tire Rationing Regulations, effective September 22, reads that whenever a Territorial Director determines that inventories of tires, tubes, or camelback are insufficient for the needs of the territory or possession, he may issue certificates to dealers authorizing the acquisition of allotments of these products.

Amendment 1, RO 1B—Mileage Rationing: Tire Regulations for Puerto Rico—effective September 20, makes changes in the sections on allotments of tires and tubes; calculation of sales by dealers in business only part of 1941; and discrimination by dealers.

Amendment 1 to RO 1C—Mileage Rationing: Tire Regulations for the Virgin Islands—extends the effective date of the order one month to October 1, 1943.

RO 1E, effective September 1, covers mileage rationing and tire regulations for the territory of Hawaii.

Number of new and used passenger-car and truck tires available for rationing during September was virtually unchanged from the August figures, according to quotas for rationing districts released by the OPA and based on allotments assigned for the month by the Office of the Rubber Director. Because of the negligible increase in the September quota of new passenger car tires some drivers will continue to find it necessary to accept used or recapped tires even though they are eligible for new tires, OPA stated. The OPA also warned that the shortage of new truck tires is increasing in seriousness and instructed local rationing boards to issue certificates for used, rather than new, truck tires whenever possible. The total tire quotas for September, as compared with those for August, follow:

September		August
	Passenger and Motorcycle, Etc.	
829,659	Grade I Tires	829,000
645,175	Grade III Tires	644,000
737,362	New Tubes	757,160
	Truck and Bus, Etc.	
416,142	New Tires	417,265
330,169	New Tubes	356,639
	Farm Tractor and Implement	
73,600	Tires	73,600

Other OPA Price Regulations Changes

Following consultations with the rubber footwear industry, the OPA in order to protect the consumer as well as the manufacturer, in Amendment 3 to MPR 132—Waterproof Rubber Footwear—effective October 2, establishes minimum specifications that most waterproof rubber footwear must meet to be entitled to the specific manufacturers' ceiling in MPR 132. These specifications, accepted by every member in the industry, reflect prior standards in the industry and include many suggestions worked out by its technical committee. Their form is similar to that of specifications used by the Army and Navy in purchasing waterproof rubber footwear. They are also determined basically by restrictions on the use of rubber promulgated by the WPB. Specifications, however, have not yet been issued for severe occupational footwear, although expected soon. This footwear presents greater difficulties in arriving at generally acceptable industry standards. Besides the cut in the amount of crude rubber for severe occupational footwear is less than that for civilian footwear in general; therefore the former is less subject to quality deterioration. If waterproof rubber footwear covered by MPR 132 cannot meet the specifications established in Amendment 3, the manufacturer must apply to OPA for a maximum price for it. Adoption of the minimum specifications is in conformance with the Taft Amendment to the Emergency Price Control Act of 1942, as amended.

Amendment 3 also includes establishment of a maximum manufacturers' price for 10-inch mine pacs, production of which was recently authorized by WPB to meet the needs of miners. Amendment 3, furthermore, provides that no charge may be made for extension of credit except such as was made during December, 1941; permits adding federal and state taxes to ceilings if the taxes are stated separately; and provides for transfers of business or stock in trade after the effective date of the regulation.

Substitute rubber in the form of raw material was brought under MPR 406—Synthetic Resins and Plastic Materials—by Amendment 2, effective September 25. Under that regulation it is given maximum prices in line with those of March, 1942. The amendment applies to substances made in whole or in part by a chemical process or from natural gums, resins, or oils, which sufficiently resemble natural or synthetic rubber to replace them for particular uses. It does not apply to finished objects or parts made of substitute rubber. About a dozen types of substitute rubber are in commercial production or show promise of being used on a commercial scale, and others may be developed. They are used in products going on the civilian market, whose prices as finished articles are covered by other regulations. Thus price control of the raw material is important to prevent pressure on the ceiling prices of the finished articles. Price control of the substitute rubber in its raw form is more practicable under the existing regulation for synthetic resins and plastic materials than under the more general provisions of the General Maximum Price Regulation to which substitute rubber was previously subject. MPR 406 has provisions that apply specifically to the pricing of materials developed since the March, 1942, base date of GMPR and contains features which make unnecessary the issuance of a separate regulation for substitute rubber.

Supplementary Order 68—Rubber and Rubber Products—issued September 11, covers the amendment of the preamble of the following price regulations relative to the use of specifications and standards: RPS 63, 66 as amended, and 87, as amended; MPR 107, 131, 143, 300, and 301.

Amendment of 250 price regulations to show conformity with the Taft Amendment to the Emergency Price Control Act of 1942 relating to use of standards in fixing prices was announced September 13; there are 444 price regulations in effect. The Taft Amendment permits ceiling prices to be fixed by reference to standards or specifications already in general use in the trade or required by other government agencies, but prohibits further "standardization" of any commodity by OPA unless the Administrator finds there is no practicable alternative for securing effective price control. The same amendment prohibited the requirement of grade labeling by OPA, which already has removed this requirement from 20 regulations. Among the 250 regulations affected are: RPS 42—Paraffin Wax; RPS 88—Petroleum and Petroleum Products; RPS 21, Formaldehyde; RPS 31, Acetic Acid; MPR 36—Acetone; MPR 38—Glycerine; MPR 79—Carbon Tetrachloride; RPS 80—Lithopone; RPS 98—Titanium Pigments; MPR 179—Pine Oil; MPR 264, Industrial Waxes; MPR 297—Natural Resins; MPR 245—Thermoplastic Scrap; MPR 406—Synthetic Resins and Plastic Materials; RPS 87—Scrap Rubber; MPR 301—Rubber Drug Sundries (Retail and Wholesale); MPR 166—Zinc Oxides; MPR 358—Insulation Cambric and Separator Cloth; MPR 28—Ethyl Alcohol (Excluding West Coast); MPR 295—West Coast Ethyl Alcohol; MPR 131—Camelback; MPR 300—Manufacturers' Prices for Rubber Drug Sundries; MPR 188—Cotton Products; MPR 37—Butyl Alcohol and Esters Thereof; RMPR 180—Color Pigments; RPS 63—Retail Prices for New Rubber Tires and Tubes; RPS 66—Retreaded and Recapped Rubber Tires, the Retreading and Recapping of Rubber Tires; MPR 107—Used Tires and Tubes; and MPR 143—Wholesale Prices for New Rubber Tires and Tubes.

R-1 Revisions; Additional WPB Activities

Natural rubber will be conserved through the substitution of synthetic rubber cement for cement made from crude rubber or natural latex, by Amendment 4 to Rubber Order R-1, as amended. Under the amendment cement may be used in the making, application, or repair of any product in the manufacture of which the order permits the consumption of rubber, synthetic rubber, or balata, and cement which does not contain crude rubber or natural latex may be used in making and repairing shoes without restriction. But many of the uses formerly permitted in shoemaking for natural rubber cement are discontinued, and cement which contains natural rubber may be used after October 1 in the manufacture and repair of shoes in a much more limited number of operations. The amendment also states that all purchasers of cement must provide the seller with a certificate that he is familiar with Rubber Order R-1 restrictions on the use of cement, and that the cement specified in the purchase order will be used in the manufacture or repair of products in the manufacture of which rubber, synthetic rubber, or balata is permitted, in certain shoe manufacture or repair operations, or for folding or assembling component parts of luggage, handbags, belts, small leather goods, and millinery. It is expected that insistence on the part of dealers in demanding such certificates will end numerous abuses under R-1.

Amendment No. 3, also issued September 7 by the Office of the Rubber Director, suspends preference ratings on rubber heel and sole products to fill civilian orders, to prevent the possibility of upsetting present methods of distributing these products. Military orders still receive preferential treatment.

Industrial tires and tubes, used on factory and warehouse trucks and dollies, can now be obtained when it is certified that they will be required for replacement within 30 days. This eliminates the difficulty experienced under the original certification, which restricted industrial tire and tube replacement to one-third the quantity mounted in the previous 90 days. Many small users had no occasion to mount industrial tires and tubes during the base period.

Under Amendment 3 chlorinated rubber is made subject to special authorization of the WPB, thus reinstating controls formerly exercised under Order M-46, superseded by R-1. Numerous other minor technical changes are made in the administration of the order.

Further restrictions on the manufacture and distribution of certain fire protective, signal, and alarm equipment are imposed by General Limitation Order L-39 as Amended August 23. Among the several changes are provisions governing the manufacture and distribution of fire hose that now cover new or used linen or flax tow hose as well as cotton rubber-lined hose; while required ratings of purchase orders for fire sprinkler systems and fire hose are raised from A-9 to AA-5 in conformity with over-all changes in the rating structure. In the list of restricted scarce materials are rubber and synthetic rubber, which may be used to the extent permitted in R-1, as amended, or to the extent permitted by any relief granted pursuant to an appeal taken in accordance with the provisions of that order.

Provisions restricting the use of rubber in the manufacture of hand trucks and other handling equipment are removed from General Limitation Order L-111 by Amendment 1 (September 6.) But the amount, type, and use of rubber are still governed by R-1. The effect of the change is to simplify procedure for permitting the use of rubber tires where needed on hand trucks and other handling equipment.

General Limitation Order L-227, as amended September 15, includes among other changes the statement that crude, reclaimed, or synthetic rubber may be used in the manufacture of fountain pens, mechanical pencils, or parts or repair parts thereof only as permitted in Rubber Order R-1, as amended, or any relief granted pursuant to an appeal in accordance with the provisions of that order.

Among the changes incorporated in Supplementary Order L-7-c, as Amended September 20, 1943—Domestic Ice Refrigerators—is a restriction on the use of crude, reclaimed, and synthetic rubber to such amounts as may be permitted under R-1. Previously the refrigerator order had contained a blanket prohibition on the use of rubber.

Rubber Machinery Orders Affected

The Office of Rubber Director made known through General Limitation Order L-61, as amended September 18, 1943, that it does not contemplate the authorization, after October 1, of additional recapping facilities and that their production would thereafter be confined to MRO and equipment for necessary replacements. The amendment also requires all manufacturers of full circle and sectional molds, matrices, curing rings, steam chambers, or kettle curing devices to submit to the ORD a list of their unfilled orders as of October 1, in order to enable ORD to make a final review of its recapping equipment program as of that date and to ascertain just what the material requirements for the industry will be for the last quarter of this year. Forms to be used by manufacturers in submitting statements are pending.

General Limitation Order L-143-a as Amended August 25, 1943—Rubber Processing Machinery and Equipment—makes changes in scheduling and shipping directions. The WPB may from time to time request all manufacturers of a particular item of rubber processing machinery or equipment to file operation reports and schedules of unfilled orders, to go on forms WPB-3100 and WPB-3101. The latter, returned to the manufacturer with shipping instructions noted thereon, shall be deemed a "frozen" schedule within the meaning of Priorities Regulation 18 for the number of months designated by the WPB. Then each manufacturer must make shipments in accordance with this schedule and must also so schedule his production to meet the shipping dates prescribed in his frozen schedule. If, however, he cannot fill his schedule on time, or can make shipments ahead of schedule, he must, as far as practicable, make shipments in the same sequence as required by the schedule. Where the delay or acceleration of the shipments will affect the dates of shipments by more than 15 days, the manufacturer must notify the WPB of the reason for the change in date and the revised dates. In the absence of specific shipping instructions a manufacturer may make and ship rubber processing machinery or equipment in fulfillment of orders authorized pursuant to the general restrictions on production, rebuilding, and reconditioning, delivery and acquisition contained in the order, in accordance with applicable preference ratings, allotments, regulations, or directions issued by the WPB. The amended order also adds to the list of rubber processing machinery and equipment automatic mill mixing devices and cord dipping, saturating, and drying equipment.

Under L-143-a the ORD assumes control of the scheduling of shipments of rubber processing machinery. This measure is to insure that such machinery be distributed in a manner to obtain maximum production of synthetic rubber products under the present program.

Report on Vinyl Resins

Baby pants and crib sheetings made from fabrics coated with vinyl resins probably cannot be made in larger quantities for a few months because the present supply of resins is inadequate for all needs, the WPB announced September 8. But by December, 1943, there should be adequate supplies for essential civilian requirements. Most vinyl resins have great resistance to abrasion and considerable tensile strength, but are only slightly elastic. There are more than 30 varieties of vinyl resins. From vinyl resins is made a rubber substitute, which for many uses is superior to rubber, and for many other uses is equally satisfactory.

Shoe soles of vinyl resins will last four to six times as long as leather soles and are now being widely used. These soles are made today largely from scrap produced in the manufacture of other products. It is collected and put through a mill similar to a rubber mill, where the scrap is homogenized under pressure and heat, then rolled into sheets from which shoe soles are cut. It is believed that this use will be increased considerably.

The type used in making baby pants and crib sheetings makes a fabric not only more abrasion-resistant than other baby pants fabrics, but more resistant to acids and other chemicals and to the wear and tear and washing. Vinyl resin fabrics are light, translucent, and easy to handle. But for these same reasons, vinyl resins are essential for a large variety of military uses. Virtually all Army and Navy raincoats today are made from fabrics coated with vinyl resins, so are the Marine Corps' camouflage ponchos. These resins are used also for insulating nearly all the wir-

ing on battleships since they will not burn except under intense heat. They are used, too, for degaussing cables which protect naval and merchant vessels against magnetic mines. Water bags to sterilize water for troops are made with vinyl resins; so strong are the smaller bags that they are dropped full of water from airplanes to desert troops. Bags used in base hospitals to place about burned arms and legs, while healing solutions are circulated through the bags, are made of this material. Other uses are being found daily that will help win the war.

At present manufacturers are meeting most of the requests for these resins. Civilian demands are being filled largely from materials not quite up to military specifications. After the first of next year it is believed the supply for civilian use will be considerably greater.

Many plasticizers now used in processing the vinyl resins are derived from butyl alcohol. Scarcity of this chemical, needed for a number of military purposes, often limits the use of vinyl resins. The chief basic materials from which they are made, normally not scarce, is calcium carbide, made chiefly from limestone and coal. Vinyl resins manufacture has risen from about 2,000,000 pounds per month before Pearl Harbor to a volume that will be about five times that early in 1944. After the war, when more materials and manpower become available, vinyl resins are expected to enter into extensive competition with rubber in many fields of trade.

Other WPB Announcements

WPB has placed the following products under allocation control: ethyl acetate and isopropyl acetate (Order M-327, issued August 31); higher aliphatic alcohols including 2-ethyl hexanol, normal octanol, normal decanol, lauryl alcohol, capryl alcohol, and mixed higher aliphatic alcohols (Allocation Order M-344, effective September 1).

Allocation Order M-243 was amended September 1 to include acetic acid and acetaldehyde as well as acetic anhydride.

It will be necessary for users of acetaldehyde to show the primary products to be manufactured from that chemical, but no longer necessary for them to indicate the end-use in applying for allocations, according to Amendment 1 to Allocation Order M-243, issued September 1. Distributors of acetic acid are requested by the WPB Chemicals Division, in making out form WPB 2947 (formerly PD-602), to specify the names of suppliers even though no space is provided on the form.

Conservation Order M-65-a as Amended September 8, 1943—Cadmium—among other changes permits, under certain conditions, the use of cadmium in the following rubber processing equipment: curing trays and drier flights.

Interpretation 1 to Allocation Order M-331—Urea and Melamine Aldehyde Resin and Molding Compound—issued September 13, states that the order covers urea aldehyde resin, melamine aldehyde resin, urea aldehyde molding compound, and melamine aldehyde molding compound. The word "urea" as used in the term "urea or melamine aldehyde resin" and in the term "urea or melamine aldehyde molding compound" modifies the words "aldehyde resin" and "aldehyde molding compound" respectively. Crystal urea is not subject to this order, but to General Preference Order M-164 (Synthetic Ammonia).

General Preference Order M-11-a as amended September 13 prohibits the shipment of one ton or more of lead-free zinc oxide unless covered by preference rating. The order also places a limit on inventories of a 45-day current supply.

General Scheduling Order M-293 as Amended September 17, 1943, includes a program to coordinate component part shipping schedules with end-product manufacturing schedules. This action is taken by writing the provisions of the Component Scheduling Procedure, the program designed to schedule production of certain types of power components, into the order and placing its operation on a mandatory basis, effective September 24. The CSP has been included through the designation of a new group of products, Class Z, under the order; and orders for these products are affected only when five items, including plants designed for the production of rubber as programmed by the Office of the Rubber Director, are programmed by the specified claimant agencies.

Limitation Order L-165—Armored Cable—was revoked on September 18.

Limitation Order L-180 as Amended August 28, 1943—Materials Entering into the Production of Replacement Storage Batteries—covers authorization of an additional 5% production during the last half of 1943 over 1941 figures.

Order M-167, which formerly governed the allocation of capryl alcohol, was revoked with the issuance of M-344, by which capryl alcohol is now controlled.

According to Priorities Regulation 18 as Amended September 8, 1943—Frozen Schedules—parts of a product which is subject to a frozen schedule are also subject to the schedule if the parts as well as the entire product are made by the same producer; this ruling also applies to parts of a component.

Herbert M. Faust, advertising manager of the Curtis Publishing Co., has been appointed director of the salvage division of the WPB, succeeding Paul C. Cabot, who recently resigned because of ill health.

The Rubber Thread Manufacturers Industry Advisory Committee was formed last month with Adam Clement as the government presiding officer. Members are: J. E. Brogdon, Carr Mfg. Co., Bristol, R. I.; G. K. Ryan, B. F. Goodrich Co., Akron, O.; E. A. Galleher, Latex Processing Co., Cleveland, O.; Harlowe Waite, United States Rubber Co., New York, N. Y.; E. W. Howard, Firestone Rubber & Latex Products Co., Fall River, Mass.; George Keltie, American Wringer Co., Woonsocket, R. I.; A. B. Lloyd, Lloyd Mfg. Co., Apponaug, R. I.; William Pitcher, Easthampton Rubber Thread Co., Easthampton, Mass.

American Management Association, 330 W. 42nd St., New York, N. Y., through its Personnel Division sponsored a Conference on Manpower Stabilization at the Hotel Pennsylvania, New York, September 28-30. Top officials of the War Manpower Commission and the War Labor Board addressed the sessions, which attracted about 2,000 industrial executives from throughout the nation. Cyrus Ching, director of industrial and public relations, United States Rubber Co., New York, served as chairman at the panel discussion on "Toward a National Labor Policy." Also among the scheduled speakers at the conference was Richard C. Oberdahn, of the personnel department, Calco Chemical Division, American Cyanamid Co., Bound Brook, N. J.

E. I. du Pont de Nemours, Inc., Wilmington, Del., has appointed Wm. Stanfield Calcott assistant chemical director in charge of development of the organic chemicals department. Dr. Calcott, since 1931, director of the Jackson Laboratory and the semi-works plant operated at the Du Pont Dye Works, Deepwater, N. J., has been succeeded by John Marlin Tinker, assistant director since 1938. Dr. George Edward Holbrook has been advanced from head of the new products division to assistant director. Dr. Calcott joined the Du Pont Experimental Station, Wilmington, in 1915 after two years with the General Electric Co., Pittsfield, Mass. In 1918 he became assistant division head of the company's general organic division and in 1928 was appointed assistant director of Jackson Laboratory. Among outstanding contributions from the laboratory while Dr. Calcott was director was the translation of the test-tube discovery of neoprene into terms of commercial production; development of a process for the large-scale manufacture of tetraethyl lead; chemicals for the rubber industry; gum inhibitors, lubrication assistants and oil stabilizers for petroleum products; and new, fast dyestuffs for the textile, paper and leather industries.

Robert E. Rose has retired after 22 years' service as director of the technical laboratory at the Du Pont Dye Works to assume new duties as consultant to the laboratory. He is succeeded as director by George H. Schuler, connected with the laboratory staff throughout Dr. Rose's tenure as director and associate director since 1938. Miles A. Dahlen continues as assistant director, to which post he was appointed in 1939, following 11 years as chemical division head at the Jackson Laboratory.

Columbia University, New York 27, N. Y., which is giving a series of evening textile courses under the supervision of H. R. Mauersberger, will present at 7:00 p.m., October 11, in Lecture Hall, 305 Schermerhorn Bldg., University Campus, a new set of textile films, to which showing those interested are invited. There will be color and sound films on rayons, chemistry, nylon, neoprene, velvets, fabric construction, conservation of textiles, cotton, and dyeing and finishing of piece goods. For further information phone Murray Hill 4-1159, or write to the Extension Director at Columbia University.

EASTERN AND SOUTHERN

Thermoid Acquires Stokes

Thermoid Co., Trenton, N. J., last month took over the Joseph Stokes Rubber Co., Trenton, and its subsidiary, Joseph Stokes Rubber Co., Ltd., Welland, Ont., Canada according to a joint statement by Fred Schluter, Thermoid president, and W. J. B. Stokes II, head of the acquired organization. Under the plan Thermoid obtains the Stokes company through 100% stock ownership. The acquisition was subject to final audits completed in mid-September.

Stokes, which manufactures hard rubber molded and plastic products, has been in business 50 years, while Thermoid, established in 1880, makes brake linings, clutch facings, fan belts, radiator hose, and other automotive replacement parts, a complete line of industrial rubber products and tufted and woven rugs. The addition of the Stokes plants gives Thermoid four separate factory locations: two in Trenton, the Southern Asbestos Division, Charlotte, N. C., and the Stokes plant in Welland, Canada. According to Mr. Schluter, Thermoid long has desired a factory in the Dominion to produce its present line for both the automotive trade in Canada and for export to the British Empire.

Foster D. Snell, Inc., 305 Washington St., Brooklyn 1, N. Y., because of expansion of activities has increased its staff. Doing research in the rubber and plastics department is Robert W. Pease, formerly with the Calco Chemical Co. Henry A. Tisch, lately with the American Chicle Co., is now a member of the Snell physical chemistry department. Harold Moore Schiller, formerly of Norda Essential Oil & Chemical Co., and Arthur Streuli have joined the physiological and organic department; while Ida Borowich has been assigned to the special research department.

National War Fund, New York Committee, 57 William St., New York 5, N. Y., has named Herbert E. Smith, president of the United States Rubber Co., Rockefeller Center, New York, as chairman of the rubber group of the Commerce and Industry Section, with Herman Muehlstein, president of H. Muehlstein & Co., Inc., 122 E. 42nd St., New York, as vice chairman.

Hercules Powder Co., Wilmington, Del., has elected Philip B. Stull vice president. Ralph B. McKinney succeeds him as general manager of the paper makers chemical department.

Paul Mayfield, since 1939 director of sales of the naval stores department of Hercules Powder, has been appointed assistant general manager. A. E. Forster, department general manger, announced September 7. Mr. Mayfield joined Hercules in 1926 as a chemist.

J. W. Van Riper

John Royle & Sons, manufacturer of extruding and wire insulating machinery for rubber and plastics, 10 Essex St., Paterson, N. J., has appointed J. W. Van Riper as sales representative to cover the southeastern United States. A graduate of Stevens Institute—Class of '29—Mr. Van Riper comes to Royle with a background of 14 years in the industrial refrigeration and controlled heat field.

The Glenn L. Martin Co., Baltimore, Md., announced recently a new elasto-plastic, called Marvinol, based on polymerized polyvinyl chloride, which, it is claimed, has already demonstrated its superiority to both natural and synthetic rubber for automobile inner tubes, household and surgeon's gloves, and many other uses. The product is a development of the Martin plastics research laboratory and a result of the work of Clayton F. Ruebensaal and Earl H. Sorg, under the direction of the Martin patent department headed by G. D. Jones. By the addition of a special non-extractable plasticizer, the stability of the polyvinyl chloride resin to temperatures up to 250° F. is improved, and the advantages of superior abrasion resistance, long flex life, impermeability to gases, resistance to oxidation, and acid and alkaline solutions are retained over a wider temperature range. Inner tubes of Marvinol have traveled over 6,000 miles without having a single pound of air pressure added since they were first placed on the wheel. Marvinol gloves, moreover, have shown a superiority over rubber and synthetic rubber in actual service conditions in hospitals and in chemical and industrial laboratories. It is pointed out that most important of all from the standpoint of the inner tube used is that fact that Marvinol tubes are 100% reclaimable. When the tube is damaged, the motorist, instead of discarding it as a total loss, will be able to trade it in on a new tube. Marvinol stocks can be compounded and mixed on a regular open rubber mill, and extruded, molded, and calendered on equipment used for natural rubbers.

Kelly-Springfield Back to Tires

Reconversion of the plant of The Kelly-Springfield Tire Co., Cumberland, Md., to the manufacture of tires was announced recently to employes of the Allegany Ordnance plant in joint statements by Major E. J. Hill, commanding officer of the Ordnance plant, and Edmund S. Burke, president of the Kelly-Springfield Engineering Co., operator of the plant under Ordnance Department supervision. The changeover from the production of small arms ammunition, which started in November, 1942, to the manufacture of synthetic tires is expected to be somewhat gradual, and limited production of the tires may begin some time in December.

Permission for the Kelly plant to resume tire production was granted by the War Production Board and the Ordnance Department because the government is as urgently in need of additional tire manufacturing capacity, and especially of trained rubber manufacturing workers, as it was in need of ammunition in 1942, and also because utilization of the Kelly plant will eliminate the usage of critical plants and the time required to train new employes in rubber manufacturing processes with which a great many Kelly employes are already familiar.

Now that adequate supplies of synthetic rubber are rapidly becoming more available, officials stated, there is an urgent need of additional plant capacity and trained workers to process it into tires. These officials further explained that the changeover at Kelly can be made now more easily and quickly than after the war ends when industries everywhere will be competing for the necessary new equipment and supplies to get back into peacetime pursuits.

Additional facilities are now available in other parts of the country for making small arms ammunition.

Pennsylvania Rubber Co., Jeannette, Pa., through General Sales Manager R. B. Cave, has announced the appointment of Holmes M. Brown as advertising and sales promotion manager. A graduate of Iowa State College (1936), Mr. Brown comes from General Electric Co., where he was assistant refrigeration advertising supervisor at Bridgeport, Conn.

"Savannah Weekly Naval Stores Review and Journal of Trade" in its issue of August 14 outlined the activities of J. M. Huber, Inc., 460 W. 34th St., New York, N. Y., in its recognition of the value of pine gum products for the compounding of synthetic rubber and its laboratory investigation into its theory and application done in cooperation with Whitney & Oettler, Savannah, Ga. The two refined gum turpentine products, Turgum and Turgum S, are produced by the Carson Naval Stores Co., Hazelhurst, Ga., whose plant has been completely remodeled, and special equipment installed to maintain the standards of purity and uniformity required for these new synthetic rubber compounding ingredients, it is reported. Whitney & Oettler is selling agent for the Carson Company.

U. S. Rubber Changes

J. W. McGovern, general manager of the tire division, United States Rubber Co., 1230 Sixth Ave., New York, N. Y., recently announced the following executive changes in the division, all effective September 1.

Curtis L. Moody, since July 1, 1942, factory manager of Dominion Rubber Co., Ltd., Kitchener, Ont., Canadian affiliate of U. S. Rubber, was made production manager of the U. S. Rubber tire division, with headquarters at Detroit, Mich., succeeding R. Y. Copland, now with the central engineering department. Mr. Moody, a graduate of Gettysburg College (1912), in 1916 became connected with Fisk Rubber Co., Chicopee Falls, Mass., and in 1926 was named general superintendent. But after 14 years he joined the U. S. Rubber organization as factory manager of the Dominion Tire Factory at Kitchener, where he remained three months before being transferred to Detroit as factory manager, then returned to Kitchener last year.

James A. Daly, production manager of the Detroit plant, was made its factory manager, replacing George R. McNear, now Pacific Coast sales manager, tire division, with headquarters at Los Angeles, Calif. Mr. Daly came to the company in 1915 as night factory inspector, but two years later went to Morgan & Wright, also in Detroit. Back to U. S. Rubber in 1922, he was made successively night superintendent, assistant superintendent, foreman, and up the scale to production manager on April 1, 1942. Mr. McNear, with the company a decade, however, started as a field representative in the tire sale department at Boston, Mass., and was made factory manager of the Detroit plant in 1942.

Thomas E. Clark, factory manager of the government-owned and company-operated shell loading plant at Charlotte, N. C., was appointed factory manager of the Fisk plant at Chicopee Falls, succeeding C. E. Maynard, resigned. Mr. Clark, a veteran of World War I, following his graduation from the University of Illinois in 1921, became a specification clerk in the G & J Tire Co., Indianapolis, Ind., and within two years was manager of the department. Other promotions followed swiftly to the factory managership in 1938. Mr. Clark was sent to Charlotte last year.

John Grennor was made assistant factory manager of the Fisk plant, where he started more than a quarter-century ago and has served in numerous manufacturing positions.

Howard G. Ling has joined the chemical sales staff of Naugatuck Chemical Division, U. S. Rubber, to cover the eastern territory, with headquarters at the New York office. Graduated from Michigan State College in 1926, he went directly to the rubber industry and has been associated with Goodyear Tire & Rubber Co., Midwest Rubber Reclaiming Co., and H. Muehlstein & Co., Inc.

Cryus S. Ching, director of industrial and public relations at U. S. Rubber, resigned last month as an employer member of the National War Labor Board, on which he had been active for more than two years.

Recent Developments

The company is also making conductive synthetic rubber containers, used to handle explosives in munitions plants without danger of either static or mechanical sparks. An additional safety feature is the absence of danger of mechanical shock from the rubber container.

Another product of U. S. Rubber is an aircraft mounting to protect sensitive radio equipment from vibration occurring in any of three directions. Designed to meet Air Force specifications, and known as a "flexi-compression" type, the mounting can be made an integral part of new equipment or readily installed to replace mountings in use. The design, moreover, is such that one mounting can be used for various loads ranging from six to twelve pounds, thus making possible the reduction of maintenance inventories and materially speeding up production of mountings for the nation's huge aircraft program.

The Navy has announced a new seaboot to provide warmth, waterproof protection, and protection against slippery decks of submarines. The wide and roomy footwear, developed by U. S. Rubber in cooperation with the research and development section of the clothing division, Navy Bureau of Supplies and Accounts, is designed to accommodate comfortably thick felt insoles, felt duffle socks, a heavy pair of wool socks, and two pair of heavy stockings. Special safety features include a cleated heel, more than ½-inch thick, for safety in traveling up and down submarine ladders, and a non-skid Sperry Top-Sider sole for sure grip and better footing on slippery decks.

Louis Marick, of the company's Detroit development division, with the cooperation of the engineering staff at Wright Field, has devised a novel method of preventing the formation of ice on propeller blades of aircraft. Utilized is Uskon conducting rubber, which through the addition of certain chemicals is made to conduct electricity, in contrast to the usual insulating properties of ordinary rubber. A strip of conductive rubber is attached to the leading edge of each propeller blade, and the passage of electricity through the material heats the leading edge sufficiently to keep ice from forming. It is expected that the principle used in the new device will be applied to other anti-icing problems in military and civilian aircraft.

U. S. Rubber is making in a New England plant anti-vesicant gloves of neoprene latex for use by decontamination squads in chemical warfare.

Other Announcements

U. S. Rubber had an exhibit of its cable and wire for war uses at the recent American Mining Congress at Cincinnati, O.

The tire division recently completed a series of dealer conferences in 19 cities throughout the nation on the synthetic rubber program and other problems confronting the industry. Five types of synthetic rubber were discussed, and an actual demonstration of the manufacture of Buna S was given. Also shown was the company motion picture, "Rubber Goes to War in the Air."

Carrier Corp., Syracuse, N. Y., through President Cloud Wampler has announced the election of Heman Greenwood as vice president in charge of the company's international division. For the past six years Mr. Greenwood had been vice president of the United States Steel Export Co., and previously had held a similar post with International General Electric.

Colonial Radio Corp., 254 Rand St., Buffalo 7, N. Y., has announced the addition to its engineering staff of W. R. Sheridan, who will specialize in rubber and plastic material problems. He was previously with the Dunlop Tire & Rubber Co., Buffalo.

Joseph R. Hewitt, executive vice president, Essex Rubber Co., Trenton, N. J., is an honorary vice chairman of National Bible Week for 1943, to be observed October 11 through 17 inclusive.

The Nineteenth Exposition of Chemical Industries, to be held the week of December 6 at Madison Square Garden, New York, N. Y., will feature laboratory methods that are new and testing equipment that will speed war production. Included will be a series of rubber testing instruments, a sub-zero test cabinet for determining low-temperature performance of equipment of any kind, and super-pressure and catalytic hydrogenation apparatus, of special value in research and development work on synthetic products. Charles F. Roth, president of the International Exposition Co., 480 Lexington Ave., New York 17, is manager of the Chemical Industries Exposition.

James F. Clark, 65, connected with The Belmont Packing & Rubber Co., Butler and Sepviva Sts., Philadelphia 37, Pa., for more than 30 years, and lately as a field representative, died suddenly at Myrtle Beach, S. C., on September 4. Funeral services and burial took place at Denison, Tex., September 7.

Olin C. Work recently joined the Vulcanized Rubber Co., Morrisville, Pa., as works manager, according to President Stanley Renton. Mr. Work has had a considerable and varied experience in the industry since his graduation from the University of New Hampshire in 1916. After serving as a lieutenant in the Army in World War I, he joined the Goodyear Tire & Rubber Co. in 1919 in the development department. He transferred to the Seiberling Tire & Rubber Co. in 1921, spending 1927 and part of 1928 as manager of the development department of Seiberling's Canadian plant, and then went with the India Tire & Rubber Co., near Akron, late in 1928. From 1934 until 1941 Mr. Work was with the Overman Tire Co., leaving to take a position as development manager for the L. H. Gilmer Co., from which he resigned to go to Vulcanized Rubber.

OHIO

Polson Changes

The Polson Rubber Co., Garrettsville, has made several organization changes caused by the recent sudden death of Paul A. Polson, executive vice president. Secretary-Treasurer R. D. Woolery assumes the duties of general manager as well. He formerly held that assignment until he was loaned to the Ordnance Department in Washington, D. C., last year; after completion of his work there he returned to Polson.

New director of sales and advertising is J. W. McConnell, who started with the company as a territory salesman in Texas and Oklahoma many years ago and later became general sales manager. This position has been assigned to William J. Fresby, for six years sales manager of Jenkins Bros.' tire value division and previously, for 20 years, with The B. F. Goodrich Co., latterly in charge of tube sales. Owing to continuous operations it has become necessary to revise maintenance; therefore Rudolph J. Dittman has entered the Polson organization as plant engineer to carry out a program involving revision and relocation of production machinery and equipment.

These changes are in line with plans of H. B. Polson, president of the company, not only to lay out a program for reversion to civilian activities after the war, but at the same time also to begin building an organizaton that will enable the executing of such plans.

For Greater Output

Seiberling Rubber Co., Akron, has put into operation at its plant to alleviate its own manpower problem a comprehensive program proposed for industry in general by the Seiberling vice president in charge of production, H. P. Schrank, to utilize fully "every facility" for increased production and thus ease the nation's manpower crisis. Broad in scope, the plan developed by the company's labor-management committee, embraces five main points: encouragement by industry and labor for fullest production from every worker through incentive pay and by suspension of artificial control of output for the duration; utilization of existing machines and skill by proper maintenance of machinery and intelligent scheduling of available labor; encouragement of transfer of manpower to highest skill ratings by temporary adjustments in seniority agreements made before the war; promotion of the use of women workers "wherever necessary and possible"; and development of tested programs to increase attendance. Under the plan three "new" groups of workers would be recruited and put to work keeping every machine operating at full capacity 24 hours a day: present experienced workers able to do more than one job, cross-indexed and classified as a "reserve corps", to be called in for short extra shifts on idle machines; high school students to work three- to five-hour shifts when such work would not affect their scholastic standing; "white collar" workers recruited for evening work under the "part shift" plan.

Mr. Schrank's suggestion came on the heels of the request by former Rubber Director Wm. Jeffers for utilization of every known facility to increase synthetic rubber tire output, following recent meetings in Washington between the Office of the Rubber Director and representatives of the rubber industry and United Rubber Workers of America.

Goodyear Announcements

Letting of contracts for a million-dollar addition which will more than double the present capacity of its cotton fabric mill at Decatur, Ala., was announced last month by The Goodyear Tire & Rubber Co., Akron, containing approximately 140,000 square feet of floor space, the addition is scheduled for completion in about six months. O. L. Beiswenger, manager of Goodyear's engineering staff, said the building will contain the latest developments in fabric mill machinery and include several innovations worked out by Goodyear engineers. About 400 more persons will be employed at the Decatur mill when the one-story addition, linked to the existing plant, is finished. Fabric from this mill is used for tires and bullet-sealing fuel tanks.

"Mae Wests", life vests for airmen, are being produced today with 50% less of the natural rubber which went into their production originally. Goodyear officials revealed that a current "Mae West" consists of single-ply containers of rubberized fabric, replacing the old type which utilized a natural rubber bladder or inner tube inside a fabric casing. Developed in the Goodyear laboratories, the new-type life vest is also said to be stronger and slightly lighter than its predecessor; it can be produced faster because the stitching for the fabric cover of the old type is eliminated. Fabric for the new type is being impregnated with natural rubber in calenders used formerly to manufacture ply fabric for tires. Each side of a new-type "Mae West" is then punched out of the fabric, next the sides are cemented together. The cement is cured in molds used formerly for the production of rubber heels and soles, providing a stronger bond even than stitching.

Arthur C. Horrocks, Goodyear public relations counsel, was one of the speakers in the first convention-by-radio in broadcasting history, according to Frank H. Irelan, chairman of the convention committee of the National Association of Foremen and general manager of the Delco division of General Motors Corp. The program went over all available stations of the Blue Network, at 8:15 EWT, September 25. Point of origin was Dayton, where the Association has national headquarters.

To Mount Synthetic Rubber Tubes

With the introduction of synthetic rubber tubes for automobile tires, Goodyear recently issued a list of directions and precautions to be followed in placing the tubes in use. Although the synthetic tubes will serve generally as well as prewar natural rubber ones, Goodyear pointed out that the former present several new problems. Thus because synthetic rubber is not so elastic as natural rubber, it is subject to base splitting if caught even temporarily under a bead and subjected to undue stress or strain at any point during mounting.

The following are the Goodyear recommendations for mounting the tubes in all passenger automobile tires:

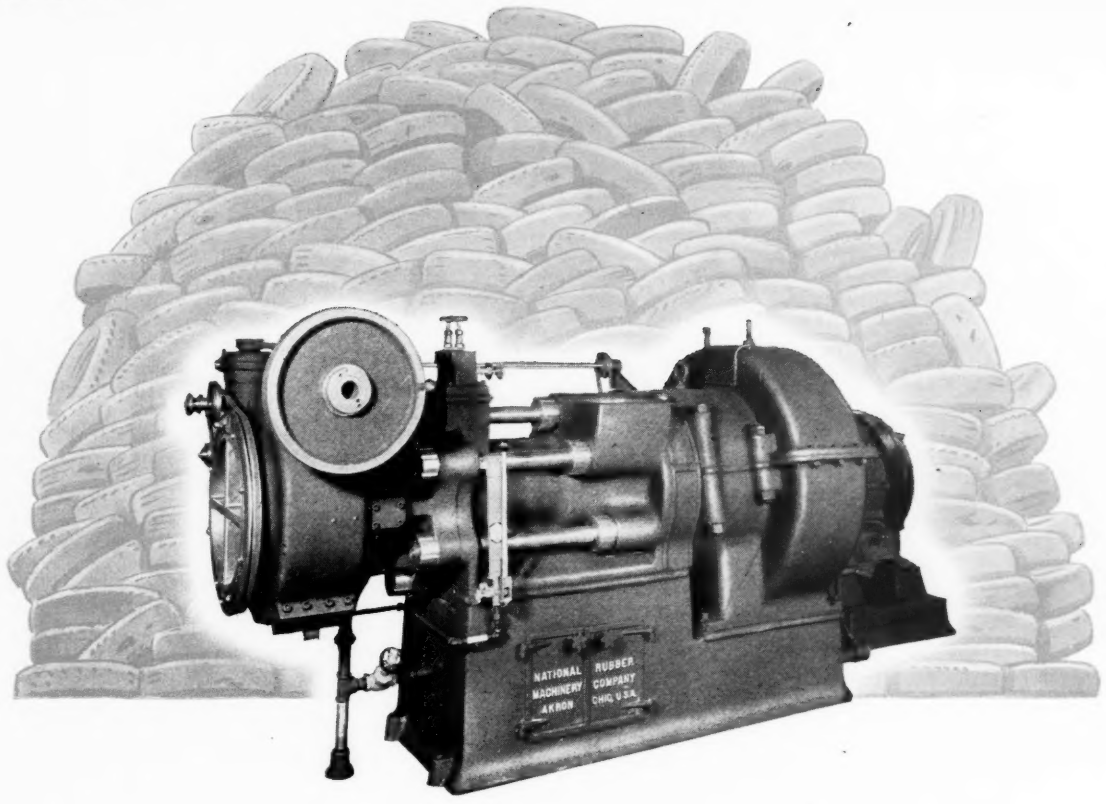
1. Inflate the tube about three-quarters full or to the point where it starts to round out; then insert the tube in the casing. 2. When the tube is inside the tire, paint both tire beads and base of the tube with a thin soap-and-water solution, made with high-grade soap flakes. 3. Mount the tire on the rim and adjust to centered position so that the beads are out of the rim well. 4. Inflate the tube to seat the tire beads firmly against the rim flanges, remove the valve core, deflate the tube completely, replace the valve core, and reinflate to operating pressure. Punctured or damaged tubes should be vulcanized instead of repaired with the cold patches conventional for natural rubber tubes.

The Association of American Battery Manufacturers, Inc., 2706 First-Central Tower, Akron, according to President B. F. Morris, has cancelled its annual convention usually held in October, in accordance with the general appeal of the Office of Defense transportation. Problems requiring immediate action, however, will be handled through special committees and letter ballots.

The Firestone Tire & Rubber Co., Akron, has appointed Ross E. Wilson general manager of the company plantations in Liberia. Mr. Wilson has been connected with this rubber-growing project since its inception and first went to Liberia in January, 1926, to join the engineering staff. Within two years he was made chief engineer. This year it is expected that the Liberian plantations will increase their production by more than 50% over the previous year as double tapping and other methods have been inaugurated to increase output to the utmost.

More than 12,000 Firestone employes, their families and friends enjoyed a six-hour dance session the night of August 30 at a special party given by the company at Summit Beach Park. Entertainment and use of the Park facilities also formed part of the program.

Firestone developed a new combination consisting of a small bottle of liquid cement and synthetic rubber patch to repair punctured rubber rafts of airmen forced down on the high seas. The repair job, it is said, can be done in 1½ minutes. The aviator, when necessary, can slide overboard the damaged raft and apply cement and patch with a brush serving also as a bottle top; then he blows up the raft by oral tube, climbs aboard, and uses special paddles to direct his course. All rafts now being made by Firestone have this new repair kit as part of their equipment.



We've engineered the strain out of the strainer

PROCESSING large quantities of reclaim has been made faster and far more efficient with development of National's new line of heavy-duty strainers.

Designed and built to handle today's big volume of reclaimed stock, and tomorrow's mountains of synthetic scrap, these National strainers incorporate features which greatly improve characteristics of feed and increase the capacity of the machine.

Strainer heads, too, have been completely re-engineered for new, strenuous duties. Power-operated and precision built, they swing open quickly and smoothly, enabling rapid changing of screens and greatly reducing the downtime of the machine.

These new National strainers are rugged, built for long, trouble-free service. Available in 6, 8½, 10 and 12-inch sizes they represent another National development for increasing production and reducing costs for the rubber industry.

ARMY E NAVY
CLIFTON DIVISION

National Rubber Machinery Co.

GENERAL OFFICES · AKRON, OHIO

Creative Engineering

Goodrich Operating Port Neches Synthetic Rubber Plant

The world's largest synthetic rubber plant, with capacity for producing 120,000 tons of man-made rubber annually and built at Port Neches, Tex., by The B. F. Goodrich Co., Akron, is now producing rubber, and is capable of turning out a fifth of the nation's normal rubber requirements. Goodrich will operate two of the four large new units. Beginning of manufacturing operations in the new plant, known in Texas as "Rubber Rancho Grande" were observed in Beaumont and Port Arthur, Tex., on August 23 and 24 with civic meetings where George W. Vaught, Goodrich vice president, was the principal speaker.

Butadiene for the "Rubber Rancho" comes direct from the new producing plant of the Neches Butane Products Co., only a few hundred feet away. Gulf, Texas, Pure Oil, Atlantic, and Magnolia are the constitutent companies in this organization.

Goodrich also operates a large synthetic plant in Louisville, Ky., and is building another one there to be operated by a group of small companies on completion. A government plant at Borger, Tex., with a substantial capacity, was built by Goodrich and began producing rubber early in August.

Plastikon putty, manufactured by Goodrich and used for glazing and sealing purposes, is now made of synthetic rubber, and at present employed chiefly for sealing metal joints in combat equipment.

Goodrich has developed diaphragms for plane carburetors and super-chargers to withstand extremes of temperature and the destructive effects of high-octane and aromatic types of fuel. The improved diaphragms, made of Ameripol D and nylon, are said to have a "flex life" almost nine times as long and to be eight times as strong as any previous ones.

Personnel No'es

E. P. Weckesser has been transferred from Detroit, Mich., where he was Goodrich district manager, to Akron to fill an assignment in the general factory administration department under Vice President T. G. Graham. Mr. Weckesser entered the industry in 1916 with the Miller Rubber Co., which later merged with Goodrich. He has held executive posts in the service and sales departments, and was chairman of the service manager's committee of Rubber Manufacturers Association, Inc., for one year. Before becoming district manager at Detroit, Mr. Weckesser was manager of the Newark district and previously staff assistant in the automobile tire sales department at Akron.

E. A. Holsten, former general supervisor, Washington district, has taken over Mr. Weckesser's assignment in Detroit.

Clyde O. DeLong, manager of operations, industrial products sales division at Goodrich since 1941, has been named manager of the Goodrich and Miller drug sundries sales, according to W. S. Richardson, general manager of industrial products sales division. George J. Fisher, formerly assistant operating manager, has been appointed acting operating manager of the division. William E. Powell was named field sales manager of Goodrich and Miller drug sundries, and Charles J. Astrup, assistant to Mr. DeLong.

In an article in the New York Journal of Commerce on September 7, Dr. Waldo L. Semon, director of synthetic rubber research at Goodrich, in reviewing the rubber situation pointed out that a century of rubber progress had been achieved in the United States in the last 100 weeks. He emphasized that although progress in synthetic rubber research had been the outgrowth of a century of experimentation that had gone into tree rubber, every problem that was encountered in the development of natural rubber had to be solved all over again with GR-S. Referring to the magnitude of the investigations that had to be carried out with compounding ingredients, such as carbon blacks and softeners, he also mentioned the further complication of the necessity of learning how to process the new synthetic rubber on the same equipment used for natural rubber. Dr. Semon paid tribute to the production men who had to convert the laboratory results of all this work into finished products, making modifications and changes when and as they became necessary. He said that GR-S was being used with complete satisfaction in a wide variety of rubber products, and although the industry and the government were reluctant to encourage the public to expect too much from this new material, he felt the public was eventually going to obtain much better service from synthetic rubber than it ever did from the natural rubber.

Mr. Richardson on September 14 in Newark, N. J., addressed 125 representatives of leading New Jersey manufacturing concerns, on the progress of the rubber industry during the war and the expanding uses of synthetic rubber. The meeting was arranged by George J. Rodan, of the Newark Pulley Co., distributor of Goodrich products in northern New Jersey.

G. V. Kullgren

NEW ENGLAND

Converse Rubber Co., Malden 48, Mass., recently expanded its research facilities with the addition of 4,000 square feet of floor space, containing all modern rubber testing equipment, including several devices not commonly used in this country. Technical direction is in the hands of Joseph Talalay, formerly with the Rubber Corp. of America, Brooklyn, N. Y., and Empire Rubber Co., Dunstable, England. The laboratory, with its staff of 12, is working on problems relating to the use of synthetic rubber and resins.

C. E. Maynard, who recently resigned as factory manager of the Fisk tire plant of the United States Rubber Co. at Chicopee Falls, Mass., was the guest of honor at a testimonial dinner at Hotel Kimball, Springfield, Mass., on August 26, attended by about 700 employes of the plant where Mr. Maynard had worked 25 years. He received many presents including a watch and a scroll. Although Mr. Maynard has not yet revealed his future plans, it is generally believed that he may accept a position in Washington, D. C.

The Connecticut Hard Rubber Co., 407 East St., New Haven 9, Conn., according to President John A. Moffitt has appointed Edward H. Clohessy production manager. Mr. Clohessy was formerly with The H. O. Canfield Co, Bridgeport, Conn., and the Naugatuck, Conn., plant of the United States Rubber Co.

Bristol Mfg. Corp. employes, Bristol, R. I., held their annual clambake and outing on August 28. The office staff had held its annual frankfurter roast the evening of August 25 on the shores of Mount Hope Bay. Plans for a minstrel show in the near future also are being developed.

Lieutenant Commander Edmund Billings, since 1934 vice president of Godfrey L. Cabot, Inc., Boston, Mass., who was reported missing in action last fall, has been officially reported as dead by the Navy Department. He lost his life in the battle of Savo Island, August 9, 1942.

Farrel-Birmingham Co., Inc., Ansonia, Conn., has announced the addition of G. V. Kullgren to the staff of its Akron, O., office. Mr. Kullgren formerly was with General Electric Co., Schenectady, N. Y., where he was associated with the industrial engineering division, specializing on the application of electrical equipment in the rubber industry. For several months he represented the Office of Rubber Director as electrical consultant on the U. S. S. R. tire plant project, which involved the design and delivery of the complete tire plant to Russia. Born in Colorado, Mr. Kullgren received his B. S. E. E at the University of Colorado in 1931. In 1933 he joined General Electric as student engineer in the testing department and in 1937 was made assistant general foreman of the department; he entered the industrial engineering division in 1940.

STUCK WITH A RUBBER PROBLEM?

When your own technical men are confronted with a synthetic rubber problem, remember this:

All the experience and facilities of Esso Laboratories of Standard Oil Development Company are at your service.

Moreover, our staff of skilled technicians will work hand-in-hand with your own men to solve your rubber compounding and processing problems.

Take advantage of this assistance at any time. You'll find it's just the help you need—and it's yours whenever you need it!

PERBUNAN

REG. U. S. PAT. OFF.

. . . THE SYNTHETIC RUBBER THAT RESISTS OIL, COLD, HEAT, AND TIME

write STANCO DISTRIBUTORS, INC., 26 Broadway, New York 4, N.Y.

WAREHOUSE STOCKS IN NEW JERSEY, LOUISIANA AND CALIFORNIA

PACIFIC COAST

California Group Outing

THE first annual outing of the Northern California Rubber Group was held August 8 at the Old Hearst Ranch near Pleasanton, Calif., attended by 120 persons, including families and friends of the Group members. The day's activities ranged from golf, swimming contests, horseback riding, dancing, and a rubber chemicals guessing contest, to eating, followed by distribution of 150 prizes. Some of the winners were: *Guessing Contest*, George Petelin, first prize, Paul Mallard, second prize; *Golf Tournament*, Emil Burger, trophy for low gross, Richard Harmon, cup for low net, Lorin Davis, third prize, Mrs. E. Evans, ladies' prize; *Swimming Contests*, Herman Jordan, first prize, Wm. Armstrong, second prize; *General Prizes*, Messrs. Petelin and Jordan and Wayne Shipley. The prizes were made possible through the generosity of the following firms:

American Rubber Mfg. Co., Bertsch Machine Works, E. I. du Pont de Nemours & Co., Inc., Farrel-Birmingham Co., Inc., Goodyear Rubber Co., Hercules Rubber Co., Oliver Tire & Rubber Co., Pacific Coast Rubber Co., Pioneer Rubber Mills, Plant Rubber & Asbestos Works, Reliance Rubber Co., H. M. Royal, Inc., Shell Chemical Co., Stanco Distributors, Inc., R. T. Vanderbilt Co.

W. J. Voit Rubber Corp., 1600 E. 25th St., Los Angeles, Calif., through Vice President W. D. Voit has announced the appointment of V. L. Yale, of the Chicago, Ill., office, as general sales manager with headquarters at Los Angeles. The company recently completed a new building consisting of 10,000 square feet. During the past year Voit also acquired several smaller additions.

The Timken Roller Bearing Co., Canton, recently announced the appointment of W. H. Richardson as general manager of all activities of all divisions of the Timken company on the entire West Coast and in the Orient. In this capacity he is to be in complete charge in that territory for the sale and merchandising of roller bearings for original equipment in railroad cars and locomotives, automobiles and trucks, and all types of industrial machinery, as well as the sale and merchandising of bearings for replacement purposes, and will also supervise all sales of Timken steel and tubing and Timken rock bits. Mr. Richardson came to Timken in 1917, serving in various sales capacities until 1929 when he was made manager of The Timken Roller Bearing Service & Sale Co. and vice president of The Timken Roller Bearing Co., Ltd., Canada, in which capacities he handled the sale of bearings for replacement in the United States, Canada, Latin American countries and the Orient. In 1941 he was made assistant general sales manager of The Timken Roller Bearing Co. and has been devoting much of his time to study

W. H. Richardson

of the development of the postwar markets for the various products of the company. He is planning to make his headquarters in San Francisco, Calif.

CANADA

The Munitions & Supply Department, Ottawa, Ont., has stated that under tire rationing regulations passenger-car tires made of synthetic rubber imported from the United States will be released for sale immediately; manufacture of such tires has already begun. Synthetic tires however, will be available only to essential users eligible for new tires. The synthetic tires will bear the following manufacturers' tag: "This tire bearing our name and serial number is made wholly or in part of synthetic rubber, in accordance with Canadian wartime specifications. For service and safety, this tire must not be driven at speeds in excess of 35 miles per hour, preferably less. For maximum mileage maintain proper inflation, rotation of tire position, wheel alignment and brake adjustment". Production of passenger tires was forbidden in Canada five days after Pearl Harbor, December 7, 1941, and no such tires were made for civilian use until January, 1943, when limited quantities of reclaimed rubber were released for the purpose. It is understood that Canadian plants have been turning out reclaimed tires at the rate of 20,000 per month. But the making of reclaim tires, the announcement said, now will be discontinued. Only limited quantities of synthetic tires will be manufactured, and they will be sold by tire ration permit. Since a ban exists on the use of the words "synthetic rubber" in respect of advertising by Canadian tire and rubber companies, there will be no "announcement" display of the innovation.

Arthur Keisall, superintendent of the Dominion Government Experimental Station at Kentville, N. S., recently reported satisfactory results in raising *kok-saghyz*, the Russian dandelion, as a source of natural rubber. The Kentville station, one of eight in Canada started last year with seed flown by plane from Russia to the United States, (plantings were made for the dual purpose of producing roots and seed) came second, on data secured from six of the eight centers, to the Central Experimental Farm, Ottawa, Ont., with an average yield of 6,200 pounds per acre. This figure compares favorably with production in Russia where 4,000 to 5,000 pounds per acre are reported, and with the United States where about 5,000 pounds per acre are obtained. Responsibility for caring for the crop at Kentville lies with J. F. Hockey, plant pathologist.

The War Services Salvage Division, Ottawa, Ont., has announced that scrap rubber—other than tires—no longer is needed as a war salvage item, marking the close of one of the most intensive collection campaigns of the war. The Division said old tires and tubes, of which 10,000 tons are urgently needed by December 31 for military reclaim purposes, are the only rubber to be collected or accepted by salvage committees from the public after September 30. Charles LaFerle, Salvage Division director, said formal notice has been received from the Fairmont Co., Ltd., the government company handling purchase of crude and scrap rubber, that after September 30 it will discontinue entirely the purchase of all other grades of scrap rubber.

Frank Dowsett, advertising manager of Gutta Percha & Rubber, Ltd., Toronto, Ont., addressed The Advertisers Guild, Toronto, at its first fall meeting, September 15.

Barringham Rubber Co., Ltd., Oakville, Ont., has carried out the first coating of fabric with Butyl rubber in Canada. Butyl rubber coated fabrics have been shown to have extremely good resistances to poison gases, particularly vesicants such as mustard gas. Edward Barringham, president of the rubber company, pointed out that Butyl rubber was a development of the petroleum refining industry and that it was at present useful for operations such as fabric coating, since it was not so enduring as other types of synthetic rubber to be used for tires. The company's first supply of crude Butyl came from the United States, but soon Canada will be producing its own Butyl at the plant at Sarnia, Ont. The first order of the Barringham company is for the Canadian Navy, the president said, adding that the new protective garments are to be provided for all armed forces.

F. A. Pankhurst of Canada Wire & Cable Co., Ltd., Montreal, P. Q., recently addressed the Electrical Maintenance Club of Montreal on the subject of "Electrical Conductors."

Resin and Lacquer Emulsions

— Developed to meet the need for *Substitutes*, *Extenders* and *Modifiers* for NEOPRENE, BUNA RUBBER and RECLAIM LATICES

VULPRENES—Solid Modifiers and Substitutes

— for CRUDE, RECLAIMED and SYNTHETIC RUBBERS

RESIN AND LACQUER EMULSIONS—These emulsions are being used today as *Latex Modifiers* and *Complete Latex Replacements* to extend, thicken, stabilize, increase penetration, improve resistance to acids, oils and solvents; in *Coatings* to produce adherent pigmented or clear coatings on paper, fabric, and rubber and as intermediate coats for lacquer on rubberized cloth; in *Rubberizing* textiles; in *Latex Treated Papers* to increase strength and improve ageing; in *Adhesives,* for paper, for leather to cloth, and cloth to cloth.

NEOPRENE AND BUNA S COMPOUNDING EMULSIONS —The recent availability of general purpose synthetics has created a need for emulsions to tackify, strengthen, and extend them for specific industrial problems.

ALKYD 18—an alkyd type resin emulsion which is non-yellowing and non-oxidizing. Film is water-white and non-tacky. Preferred where slight oxidizing action may be considered harmful to rubber. Extender for synthetic latices and reclaim in coating, combining and impregnating processes, particularly for Neoprene.

EMULSION 58-8—a series of emulsified elastomers containing up to 65% solids. Recommended for use as full latex replacements in impregnation and combining.

PIGMENT BASES—concentrated aqueous dispersions of pigments in resin bases, available in all shades and viscosities suitable for spreading, spraying, etc.

Also Acrylic, Butyl, Vinyl, Maleic, Piccolyte, Cumar, Phenolic, Hydrocarbon, Ethyl Cellulose, Cellulose Acetate and Nitrate emulsions and solutions for various applications.

AMERICAN RESINOUS CHEMICALS CORPORATION

Rubber Substitutes • *Rubber Synthetics* • *Resin, Lacquer Emulsions*

MAIN OFFICE and LABORATORIES

PEABODY, MASS.

Factory Branches: Newark, N. J. and Chicago, Ill.

OBITUARY

Fred Colley

FRED COLLEY, head of employes' activities at the Goodyear Tire & Rubber Co., Akron, O., died of a sudden heart attack in his office on September 9. Born in Akron on December 23, 1878, he attended grade school, business college for two years, and Goodyear Industrial University for a year. He joined the Goodyear organization in the pressroom on December 23, 1898, and served successively as foreman in the crude rubber department, foreman of the compound room, and crude rubber general foreman before becoming director of employes' activities. Prior to coming to Goodyear the deceased had worked for the Aetna Rolling Mill Co. and the India Rubber Co.

Funeral services were held September 13 at Grace Reformed Church, with burial in Rose Hill Cemetery, Akron.

Mr. Colley is survived by his daughter-in-law and three grandchildren.

Horatio Gilbert

HORATIO GILBERT, one time rubber executive, died August 29 at North Marion, Mass., after a brief illness. He was born in Milton, Mass., March 20, 1885, and attended Milton Academy and Harvard College. After about a year in a brokerage office Mr. Gilbert became manager of the C. C. C. Fire Hose & Rubber Co., Canton, Mass., where he remained until 1924 when he went to Florida to engage first in the lumber and then in the real estate business.

The deceased belonged to the Institute, Hasty Pudding, Dickey & Fox, Eastern Yacht, The Tedesco Golf, and the Harvard clubs.

Funeral services were held at the Forest Hills Chapel, Boston, Mass., on August 31. The next day cremation and interment took place at the Forest Hills Cemetery.

Surviving are the widow and a sister.

Frank S. Frost

AN EAR infection caused the death, on August 9, of Frank S. Frost, partner of The Frost Rubber Works, Chicago, Ill. In his early association with the rubber industry he had been connected with The Diamond Tire & Rubber Co. Later the deceased entered into the jobbing of rubber products, which led to the forming of the partnership of The Frost Rubber Works in 1920. The firm is now engaged in manufacturing rubber parts exclusively for the war effort.

Mr. Frost was born in Chicago on September 8, 1876. He was a 32nd degree Mason.

Funeral services were held August 12 at Postelwaite Undertaking Chapel, Oak Park, Ill., with interment at Acacia Park Cemetery Mausoleum, Chicago.

Two sons survive.

Albert J. La Vasseur, 33, assistant chemist at the Firestone Rubber & Latex Products Co., Fall River, Mass., died September 3 in the Attleboro (Mass.) Hospital, following a long illness. He is survived by his wife, a son and a daughter.

A.S.T.M. Standards

(Continued from page 60)

ness and brittleness.

The two types of ethyl cellulose (D 743) are divided into three grades, filled, unfilled, and temperature resistant.

The three types of polyvinyl plastics provided for in D 744 are for general purpose heat and oil resistance, and cold resistance. Nine grades of material are included.

The polyvinyl butyral plastics are of thermoplastic and curing types. The materials are based on polyvinyl butyral resin, obtained by the partial acetalization with butyraldehyde of the product obtained by the complete or partial hydrolysis of polyvinyl acetate. Plasticizers, coloring agents, modifying agents, etc., can be incorporated as may be necessary to obtain the desired properties. There are seven grades of material, three thermoplastic and four of the curing type. Although the hardness serves as a general indication of grade in most cases, the hardness range of one grade suitable for a given application will overlap the hardness range of another grade. The low temperature clasification, as determined by the brittleness test (Thiokol test) (D 736 - 43 T), also serves in classifying the various grades.

It was indicated in the new method for stiffness in flexure that the procedure is well suited for determining flexibility over a wide range. The apparatus is of the cantilever beam bending type of which the Olsen stiffness tester (Tour-Marshall and Olsen design) is an example.

The test for brittleness of non-rigid plastics (D 746) establishes a temperature above which a normally non-rigid material is not brittle in its reaction to sudden deformation. The test uses an apparatus with a striking arm which moves at a designated rate. Beginning with the lowest temperature (—70 C. or at least lower than the temperature at which non-failure is thought to be) specimens are tested at 10-degree temperature intervals until a break is not obtained. Tests are repeated until five consecutive cases of non-breaking are observed. Coolant used in the bath may be acetone, ethyl alcohol, butyl alcohol, etc. For very low temperatures liquid nitrogen is considered suitable.

Fall Chicago Meeting

OCTOBER 15 is the date of the next meeting of the Chicago Group, Division of Rubber Chemistry, A. C. S., to be held at 6:30 p. m. in the Terrace Casino of the Morrison Hotel, Chicago, Ill. Edward T. Meyer, Group chairman, has announced two speakers: George B. Vila, Naugatuck Chemical Division, United States Rubber Co., who will discuss "Some Practical Aspects in the Processing and Compounding of GR-S"; and a second speaker who will present a non-technical subject.

Montreal Plans

THE Rubber & Plastics Division, Montreal Section, S. C. I., will again this season convene the second Friday of each month. The first meeting, set for October 8, will include the colored film put out by *Modern Plastics*, "This Plastic Age", and I. R. McHaffie, manager of research and development for C. I. L., who will give a talk on the manufacture of plastic materials. W. B. Wiegand, director of research, Columbian Carbon Co., will speak at the November session on "New Developments in Colloidal Carbons."

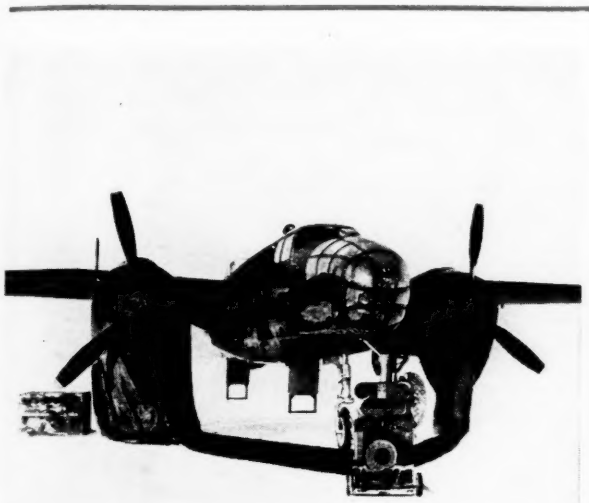
Phillips Petroleum Co., Bartlesville, Okla., is erecting a furnace black plant for the manufacture of a new type of black, called Philblack. This plant, which will produce about 22 million tons of the black annually, is being built as a private enterprise by Phillips adjacent to the Phillips designed and operated government butadiene manufacturing plant in the Texas Panhandle. Full-scale production is anticipated by the year-end. Philblack is the result of years of intensive research by Phillips to develop a black particularly adapted to the manufacture of synthetic rubber automobile tires.

Fixed Government Prices*

	Price per Pound	
Balata	Civilian Use	Other Than Civilian Use
Manaos Block	$0.38¾	$0.38¾
Swinam Sheet	.42½	.42½
Guayule		
Guayule (*carload lots*)	.17½	.31
Latex		
Normal (*tank car lots*)	.26	.43½
Creamed (*tank car lots*)	.26¾	.44¼
Centrifuged (*tank car lots*)	.27¾	.45¼
Heat-Concentrated (*carload drums*)	.29½	.47
Plantation Grades		
No. 1X Ribbed Smoked Sheets	.22½	.40
1X Thin Pale Latex Crepe	.22½	.40
2 Thick Pale Latex Crepe	.22	.39½
1X Brown Crepe	.21⅜	.38⅞
2X Brown Crepe	.21⅛	.38⅝
2 Remilled Blankets (Amber)	.21¼	.38¾
3 Remilled Blankets (Amber)	.21⅛	.38⅝
Rolled Brown	.18	.35½
Synthetic Rubber		
GR-M (Neoprene GN)	.27½	.45
GR-S (Buna S)	.18½	.36
GR-I (Butyl)	.15½	.33
Wild Rubber		
Upriver Coarse (crude)	.12⅝	.26⅛
(washed and dried)	.20¼	.37⅜
Islands Fine (crude)	.14⅝	.28¼
(washed and dried)	.22½	.40
Caucho Ball (crude)	.11⅝	.24¾
(washed and dried)	.19½	.37
Mangabiera (crude)	.08½	.19¾
(washed and dried)	.18	.35½

*For a complete list of all grades of all rubbers, including crude, balata, guayule, synthetic, and latex, see Rubber Reserve Co. Circular 17, p. 169, May, 1943, issue.

ONE OF A SERIES DESCRIBING PLASTICIZERS AND MODIFIERS—FOR USE WITH NATURAL AND SYNTHETIC ELASTOMERS—PRODUCED BY THE RESINOUS PRODUCTS & CHEMICAL COMPANY



Official Air Forces Photos

For temperature extremes . . . two outstanding synthetic rubber plasticizers

For synthetic rubber stocks with extreme low temperature flexibility, plus permanence at high temperatures, Dibenzyl Sebacate and Dibenzyl Phthalate offer outstanding merits.

These two plasticizers are of special value in the compounding of synthetic rubber for such applications as airplane parts, which must remain flexible at temperatures encountered in Arctic regions or the sub-stratosphere . . . and must also be permanent under prolonged exposure to desert heat.

Dibenzyl Sebacate and Dibenzyl Phthalate are also highly effective in vinyl compositions, and merit investigation for specialty work.

3 awards to The Resinous Products & Chemical Company and its associates, Rohm & Haas Company and Charles Lennig & Company.

PHYSICAL PROPERTIES

PROPERTY	DIBENZYL SEBACATE	DIBENZYL PHTHALATE
Color	Pale straw yellow to brown	Less than 10 (Gardiner Holdt)
Odor	Ethereal	Slight Benzyl odor
Acid No.	Less than 0.6% (as Sebacic)	Below 1.0%
Boiling Point	265° C. at 4 mm.	261° C. at 5 mm. 280° C. at 10 mm. 291° C. at 15 mm.
Congealing Point	25–28° C.	
Freezing Point		36–38° C.
Pounds per gallon	8.8	9.7
Specific Gravity	1.05 - 1.07 at 25° C./15° C.	1.17 at 28° C.
Saponification Number	285–300	315 (approx.)

OTHER PLASTICIZERS AND SOFTENERS

1. **SOFTENERS FOR HIGH TEMPERATURE SERVICE.** Resin R6-3, Duraplex C-50LV (100% solids), Dibenzyl Sebacate*, Dibenzyl Phthalate.
*Excellent high temperature stability for elasticator type softeners.

2. **SOFTENERS FOR HIGH DUROMETER HARDNESS.** Resin R6-3, Duraplex C-50LV (100% solids).

3. **SOFTENERS FOR LOW DUROMETER HARDNESS.** Dibutyl Sebacate, Dibenzyl Sebacate, Dicapryl Phthalate.

4. **SOFTENERS FOR LOW TEMPERATURE FLEXIBILITY.** Dibutyl Sebacate, Dibenzyl Sebacate, Dibenzyl Phthalate, Dicapryl Phthalate.

THE RESINOUS PRODUCTS & CHEMICAL COMPANY

WASHINGTON SQUARE, PHILADELPHIA, PA.

Patents and Trade Marks

APPLICATION

United States

2,325,678. Tobacco Pouch Including a Body Portion Composed of an Outer Protective Layer and an Inner Layer of Thermoplastic Rubber Hydrochloride. I. Gurwick, assignor to Shellmar Products Co., both of Mount Vernon, O.

2,325,703. Receptacle for Inflammable Fluids Including a Base as Support, a Mast Rising from the Base, and a Non-Heat Resistant Thin Strand of Rubber Elastic Having One End Attached to the Upper Part of the Mast. E. L. Nute, Wakefield, and E. A. Willey, assignors to Converse Rubber Co., both of Malden, both in Mass.

2,325,762. Boat Loading Attachment for Automobiles Including a Pair of Substantially U-Shaped Members Supported in an Upright Plane, an Upright Supporting Each of the U-Shaped Members, and a Vacuum Cup Supporting Each of the Uprights. C. F. Ford, Sigourney, Iowa.

2,325,977. Tubular Woven Elastic Garment Including Warp and Elastic Weft Threads and Having a Top Portion of Uniform Diameter and a Lower Adjacent Portion. R. and J. Pickles, both of Burnley, England.

2,326,076. Resilient Roller Including a Laminated Hub, a Laminated Rim Concentric with the Hub, and an Annular Rubber Core between and Connected Circumferentially with the Hub and Rim on the Outer Periphery of the Hub. P. A. Solem, Rockford, Ill.

2,326,488. Tire Including a Rim Forming a Base, Coil Springs Enclosed in a Fabric Covering, and a Rubber-Impregnated Fabric Cemented to the Outer Portion of the Covering to Form the Tread. W. A. Owen, Johnson City, Tenn.

2,326,535. Conveyer System Having Conveyer Supporting and Driving Means Including a Pulley with a Relatively Deep Groove with Rubber-Like Lining Means in the Groove thereof. H. W. Hapman, Detroit, Mich.

2,326,669. Liquid Wax Applicator Including a Hollow Handle with an Outer Open End, a Removable Cap, a Tubular Element at the Opposite Inner End of the Handle, a Plate Carried by the Opposite End through Which the Tubular End Extends, and a Flexible Rubber Washer Having Spaced Flanges on Opposite Sides of the Plate. H. C. Nimrick, Detroit, Mich.

2,326,693. Retainer Including a Strip of Rubber-Like Elastic Material Having Sagittate Ends; the Articles Are Strung on the Portion of the Strip between the Ends. J. J. Sindler, Boston, Mass.

2,326,790. Heel Pad Including a Rubber-Like, Grooved Material; the Walls of the Grooves Are Spaced Apart; the Ends of the Grooves Are Closed, and Downwardly Extending Projections Are between the Grooves. M. Margolin, Elgin, Ill.

2,326,828. Traveler for Ring Spinning and Twisting, the Surface of Which Comprises a Synthetic Linear Super Polymer. W. M. Camp, Glen Ridge, assignor to Clark Thread Co., Newark, both in N. J.

2,326,829. Traveler with Wearing Surface of a Vinylidene Chloride Polymer. W. M. Camp, Glen Ridge, assignor to Clark Thread Co., Newark, both in N. J.

2,326,830. Traveler with Wearing Surface of Polystyrene. W. M. Camp, Glen Ridge, assignor to Clark Thread Co., Newark, both in N. J.

2,326,831. Traveler with Wearing Surface of a Water Insoluble Cellulose Ether. W. M. Camp, Glen Ridge, assignor to Clark Thread Co., Newark, both in N. J.

2,326,832. Traveler with Wearing Surface of a Plasticized Cellulose Ester. W. M. Camp, Glen Ridge, assignor to Clark Thread Co., Newark, both in N. J.

2,326,833. Traveler with Wearing Surface of a Vinyl Ester Polymer. W. M. Camp, Glen Ridge, assignor to Clark Thread Co., Newark, both in N. J.

2,326,834. Traveler with Wearing Surface of an Acrylic Polymer. W. M. Camp, Glen Ridge, assignor to Clark Thread Co., Newark, both in N. J.

2,326,976. Flexible Coupling for Shafts, Including a Pair of Separate Substantially Conically Shaped Coupling Disks Adapted to Be Connected Respectively to a Pair of Shafts and Having Their Smaller Ends Adiacent, and a Flexible Rubber Mass between the Disks and Bonded Thereto. F. Schmidt, Hamburg-Harburg, Germany; vested in the Alien Property Custodian.

2,327,035. Unitary Buffer Stem Sleeve Including an Inner Tube of Wear-Resisting Material around Which Are Wound Vulcanized Layers of Rubber and Fabric. D. W. Gray, Everett, and W. B. Roger, Jr., Dedham, assignors to Fabreeka Products Co., Inc., Boston, all in Mass.

2,327,057. Tire Having a Tread Including a Plurality of Tread Elements of Uniform Width at the Tread Surface and These Separated by Grooves of Equal Width. C. F. Olensend, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,327,061. Fan Including a Hub Formed Entirely of Molded Rubber and Having a Plurality of Ears Formed Integral therewith. I. N. Pollingher, Boston, Mass.

2,327,291. Sealing Ring Including a Body of Material Having the Resilient Characteristics of Rubber. L. R. Twyman, Bloomfield Township, assignor to Vickers, Inc., Detroit, both in Mich.

2,327,389. Clutch Element Including a Metal Disk Having a Flange, a Separate Hub, and a Packing of Rubber Composition Forced into the Annular Space between Hub and Flange. E. Bagnall, Chicago, Ill.

2,327,604. Coupling for Power Line Shafts, Including Two Disks with Hub Extension on Each, a Plurality of Holes through the Face of Each Disk in Uniform Position, and a Rubber Member of a Size to Pass through the Holes and Fit therein. W. J. McCartney, Birmingham, Ala.

2,327,891. In a Combination Turn Knob and Mandrel, a Turn Knob Including an Integral One-Piece Body of Resilient Rubber Having a Manually Engageable Head Portion and a Shank Portion Integral therewith. W. P. Herman, Providence, R. I.

2,328,035. Ski Pole with a Snow Ring, Including a Tubular Ring and Rubber Spokes with a Cotton Carcass Molded Integrally with the Ring. H. N. Smith, Washington, D. C.

2,328,121. Spring Tooth Including a Metallic Crop Engaging Tine, a Supporting Shank therefor, and a Rubber Damper Attached Solely to the Tooth between Shank and Tine. M. Bartek, assignor to Deere & Co., both of Moline, Ill.

2,328,378. Bumper Including a Rubber Body of Approximate Frusto-Conical Shape Having an Opening Axially therein. J. C. Dudley, Detroit, assignor to Chrysler Corp., Highland Park, both of Mich.

2,328,550. Cushioning Device Including an Outer Member Providing a Friction Surface on an Inner Face Thereof, a Plurality of Friction Shoes Engaging the Surface, and an Expandable Rubber Core Adapted in Expanding to Bear on the Continuous Surface and Force the Shoes into Frictional Engagement with the Friction Surface. J. P. Gallagher, Jersey City, N. J.

2,328,607. Machine for Removing Husks and Silks from Corn, Including a Plurality of Alternately Rubber and Metal Surfaced Cooperating Rolls; the Rubber Surfaced Rolls Have Substantially Smooth Rubber Surfaces Extending throughout Their Length. I. E. Borchers, La Fayette, Ind., assignor to De Kalb Agricultural Association, Inc., De Kalb, Ill.

2,328,877. Cushioning Device Including a Rugged Metal Open Band and a Block of Rubber Fitted in the Band. J. P. Gallagher, Jersey City, N. J.

2,328,878. Cushioning Device Including a Resilient Unit Havig a Block of Rubber in the Form of a Hexagonal Prism with a Plurality of Closely Positioned Holes. J. P. Gallagher, Jersey City, N. J.

2,328,948. Seal for Draft Opening of a Keg Having a Bushing and a Tubular Sealing Member of Rubber or Rubber-Like Material Positioned in Alinement with the Bushing. T. N. Bourke, Grosse Pointe, Mich.

Dominion of Canada

413,801. Sheet Material with Rubber Having a Thickened Margin Including a Portion of the Sheet Material Curled upon Itself. Archer Rubber Co., assignee of W. F. Gowdy, both of Milford, Mass., U. S. A.

414,060. Aircraft Landing Wheel with a Pneumatic Tire Having Flexible Flap Members Secured, in Circular Series, to a Sidewall of the Tire. G. D. Maw and C. R. Rouse, co-inventors, both of Montreal, P. Q.

414,085. Multiple Tire-Tube Unit Including an Outer and an Inner Tube. L. R. Hollingshead, Sacramento, Calif.

414,140. Jack Screw for Cowl Flaps, Including a Jack Having a Screw Element, a Threaded Sleeve Element in Longitudinal Engagement with the Screw Element, a Member Adapted to Be Secured to the Flap, and a Resilient Rubber-Like Body Connecting the Outer End of One of the Elements with the Member. Lear Avia, Inc., assignee of W. P. Lear, both of Piqua, O., U. S. A.

414,159. Resilient Joint Assembly Adapted for Gearshift Linkage, Including an Arm Having an Opening, and a Rubber Bushing Seated in the Opening and Extending over Opposite Faces of the Arm. Thompson Products, Inc., Cleveland, O., assignee of M. H. Alldredge, Detroit, Mich., both in the U. S. A.

414,175. Air- and Gas-Tight Package Including an Enclosure of Rubber Hydrochloride with Rubber Deposited on the Surface thereof; the Contents of the Package Are under Reduced Pressure. Wingfoot Corp., Wilmington, Del., assignee of C. O. Pike, Akron, O., both in the U. S. A.

414,179. Bottle with a Label of Rubber Hydrochloride Shrunk around the Large Body Portion of the Bottle; the Band of Film, While in Place on the Bottle, Is in Stretched Condition. Wingfoot Corp., Wilmington, Del., assignee of J. F. Vincent, Akron, O., both in the U. S. A.

414,191. Girdle with a Flat Tubular Stiffening Band Portion at the Upper Edge. L. J. A. Amyot, P. Q.

414,195. Bottle Closure Having a Pleated Sidewall with an Internal Zone of Adhesive Latex Coating. H. C. Harvey, Sturgis, Mich., U. S. A.

414,212. Improvements in Typewriters, Comprising a Supplementary Roller Supported above the Ordinary Roller and Geared thereto; so on One Roller Being Turned the Other Roller Is Also Turned. A. A. Webbe, Perth, Australia.

414,275. Pneumatic Tire Safety Tube Including an Outer Tube Wall and an Inflation Valve Mounted in. Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont., assignee of F. J. Armstrong, Birmingham, Warwick, England.

414,295. Cup Packing Including a Layer of Wire-Reenforced Fabric and a Yieldable Rubber-Like Impregnant. Johns-Manville Corp., New York, N. Y., assignee of G. Christenson, Plainfield, N. J., both in the U. S. A.

414,519. Syringe Including a Closure at One End and a Rubber Bulb Connected to the Closure. C. A. Anderson, Burlington, N. C., U. S. A.

414,532. In a Solenoid Controlled Valve a Thin-Walled Sleeve, a Chamfered Surface at One End of the Sleeve, a Plug Having a Recessed Portion in the Side thereof, and a Compressed Resilient Rubber Member in the Recessed Portion. J. B. Parsons, Toledo, O., U. S. A.

414,598. Adhesive Sheet Having a Flexible Backing and an Adhesive Coating Firmly United thereto and Including a Solid Cycloparaffin Resin and a Rubbery Base. Minnesota Mining & Mfg. Co., assignee of H. J. Tierney, both of St. Paul, Minn., U. S. A.

414,778. Metal Printing Roll with a Printing Surface on Which Molded Hard Rubber Insignia in Relief Are Vulcanized. H. L. Boardman and M. L. Hendrix, co-inventors, both of Longview, Wash., U. S. A.

414,862. Vehicle Spring Suspension System Having Longitudinally Extending Side Sills, a Cross Sill Arranged Transversely between and Fastened to the Side Sills, and Silencing and Vibration Dampening Strips as Rubber Cushioning Means Secured to the Side and Cross Sills. E. G. Budd Mfg. Co., Philadelphia, Pa., assignee of T. Ulrich, Detroit, Mich., both in the U. S. A.

414,881. Rubber Product Having a Halogen-Hardened Surface Overlaid with an Adherent Baked Film of Phenol-Aldehyde Resin. Canadian Industries, Ltd., Montreal, P. Q., assignee of C. M. Langkammerer, Wilmington, Del., U. S. A.

414,948. Side Bearing Having a Housing with a Plurality of Tubular Members and Annular Rubber Means Positioned within Each Tubular Member. Symington-Gould Corp., assignee of D. S. Barrows and E. H. Blattner, co-inventors, all of Rochester, N. Y.

United Kingdom

554,216. Pneumatic Tires. United States Rubber Co.

554,359. Window-Wiper Mechanisms. Rover Co., Ltd., and P. A. S. Iversen.

554,386. Liquid Damped Resilient Suspension Devices for Vehicles. Automotive Products Co., Ltd., Ribbesford Co., Ltd., J. H. Onions, and P. W. Thornhill.

554,397. Weatherproof Garments, Particularly for Use at Sea. N. Gill.

554,456. Electrical Communication Systems. Standard Telephones & Cables, Ltd.

554,890. Rubberized Fabric for Use in Making Pipes. G. D. Ingram.

PROCESS

United States

2,325,637. Porous Rubber Articles Wherein a Liquid Containing a Rubber Latex and Suitable Compounding Ingredients Is Formed into a Froth Which Is Gelled and Vulcanized in a Mold. W. E. Stewart, Cuyahoga Falls, assignor of one-half to T. A. Te Grotenhuis, Olmstead Falls, both in O.

2,325,735. Vulcanization of Rubber, Which Includes Heating It in the Presence of a Dimorpholyl Sulphide. E. S. Blake, Nitro, W. Va., assignor to Monsanto Chemical Co., St. Louis, Mo.

2,325,903. Making Sponge Rubber Floor Covering Material Which Includes Forming a Sheet of Blowable Sponge Rubber Compound and the Subsequent Separate Step of Blowing and Expanding the Sheet Freely to Full Blown Sponge Rubber Thickness. G. W. Blair and V. H. Bodle, assignors to Mishawaka Rubber & Woolen Mfg. Co., all of Mishawaka, Ind.

2,326,160. Method of Depositing Rubber of Uniform Thickness upon Formers and of Stripping the Rubber Deposit therefrom. S. B. Neiley, Winchester, and E. E. Habib, Arlington, assignors

INCREASE YOUR RUBBER MILL PRODUCTION

WITH

TIMKEN BEARINGS

Friction bearings long have outlived their usefulness in rubber mills as they did many years ago in steel rolling mills. Steel mill operators were quick to see the advantages of roller bearings on roll necks, but rubber mill operators have been slower in realizing their benefits.

Rubber mills, like steel mills, operate smoother; are easier to lubricate; possess greater endurance; and require less maintenance when the rolls are mounted on Timken Tapered Roller Bearings, because they are completely and thoroughly protected against friction, wear, radial-thrust loads and roll misalignment.

Another specific and important advantage in the case of rubber mills is prevention of lubricant leakage and resultant contamination of the product. It's time you changed your rubber mills over to Timken Bearings. Consult the mill builders or our engineers. The Timken Roller Bearing Company, Canton, Ohio.

Anticipate post-Victory competition by redesigning your equipment now and using more Timken Bearings.

★

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS

Chemicals Market Notice

In the interests of paper conservation, INDIA RUBBER WORLD is discontinuing its regular monthly report of the compounding ingredients market, but will list bimonthly, starting with the November issue, the chemical prices given heretofore inasmuch as most prices are frozen. However, current price changes will be mentioned in news notes as they occur in intermediate months when we are so advised.

to Dewey & Almy Chemical Co., North Cambridge, all in Mass.

2,326,690. **Improved Composition Storage Battery Separator Composed Essentially of Porous Rubber.** R. H. Schubert, Weehawken, N. J., assignor to National Lead Co., New York, N. Y.

2,327,001. **Porous Surface on Spongy Material of Foam Rubber or the Like.** J. F. Schott, assignor to Mishawaka Rubber & Woolen Mfg. Co., both of Mishawaka, Ind.

2,327,028. **Stripping a Solid Rubber Tread Block from a Rectangular Tread Link Frame Having Parallel Pivot Members.** C. O. Dohrenwend, Blue Island, assignor to Burgess-Norton Mfg. Co., Geneva, both in Ill.

2,327,573. **Rubber Impregnated Fibrous Material.** W. J. Walsh, assignor to Burlington Mills, Inc., both of Burlington, Wis.

2,327,627. **Production of a Continuous Web of Polyvinyl Acetal Resin and the Relieving of Forming Stresses therein.** G. J. Esselen, Swampscott, Mass., assignor, by mesne assignments, to Monsanto Chemical Co., St. Louis, Mo.

2,328,614. **Resilient Mounting.** W. F. Busse, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y.

Dominion of Canada

414,177. **Production of Moisture-Proof Kraft Paper by Super-Calendering Kraft and Coating It With a Moisture-Proofing Coating.** Wingfoot Corp., Wilmington, Del., assignee of H. R. Thies, Kent, and C. M. Carson, Cuyahoga Falls, co-inventors, both in O., both in the U. S. A.

414,245. **Manufacture of Coated Wire by Depositing on the Wire Finely Divided Crystalline Synthetic Linear Polymeric Amide by Passing the Wire through a Water Suspension of the Polymeric Amide, Fusing the Deposit of Polymeric Amide, and Quenching the Fused Coating.** Canadian Industries, Ltd., Montreal, P. Q., assignee of P. R. Austin, Wilmington, Del., U. S. A.

414,349. **Applying Talc and the Like to a Traveling Web of Rubberized Open-Mesh Fibrous Material, Which Includes Suspending Finely Divided Talc in an Air Stream.** E. B. & A. C. Whiting Co., Burlington, Vt., assignee of E. Lundgren, Braddock Heights, Md., both in the U. S. A.

TRADE MARKS

United States

402,240. **Baby Bunting.** Baby pants. Seiberling Latex Products Co., Barberton, O.

402,270. Representation of a russet sign with the words: "**Primitive Footwear.**" Shoes. Frank Cardone, Brooklyn, N. Y.

402,342. **Glider.** Corsets, garters, and brassieres. H. W. Gossard Co., Chicago, Ill.

402,156. Representation of a coat-of-arms divided into four sections, one containing verticle stripes, another being blank, a third containing two stars, and a fourth containing shaded cubes; and a banner across the top with the word: "**General.**" Molded rubber goods. General Tire & Rubber Co., Akron, O.

RECLAIMED RUBBER

THE shift from all-reclaim Grade F camelback to Grade C camelback which contains 40% GR-S, scheduled for October 1, heralds the beginning of a new era for reclaimers as well as manufacturers of camelback. For the reclaimer the arrival of scrap containing larger and larger amounts of synthetic rubber will soon become an actuality, and the manufacturer of camelback now has to use GR-S in really significant amounts. Natural rubber reclaim, particularly the high-quality grades, will become less and less available, and a whole new series of reclaims containing varying amounts of synthetic rubbers should be the major types on the market before very long.

Ceiling prices on selected grades of natural rubber reclaim follow:

Ceiling Prices

	Sp. Grav.	¢ per Lb
Auto Tire		
Black Select	1.16-1.18	6⅝/ 6¾
Acid	1.18-1.22	7⅛/ 7¾
Shoe		
Standard	1.56-1.60	7 / 7¼
Tubes		
Black	1.14-1.26	11¼/11½
Gray	1.15-1.26	12½/13¼
Red	1.15-1.32	12 /12¾
Miscellaneous		
Mechanical blends	1.25-1.50	4½/ 5½
White	1.35-1.50	13½/14½

The above list includes those items or classes only that determine the price bases of all derivative reclaim grades. Every manufacturer produces a variety of special reclaims in each general group separately featuring characteristic properties of quality, workability, and gravity at special prices.

Rims Approved and Branded by The Tire & Rim Association

Rim Size	Aug., 1943
15" & 16" D. C. Passenger:	
16x4.00E	35,992
16x4.50E	17,272
15x5.00E	936
16x5.00E	3,980
16x5.00F	3,364
15x5.50F	6,278
16x6.00F	1,612
17" & Over Passenger:	
18x2.15B	15,213
Military:	
16x4.50E	82,304
16x6.50CS	75,053
20x4.50CR	9,039
20x6.00CT	12,136
22x6.00CT	1,094
18x8.00CV	1,267
20x10.00CW	1,505
24x10.00CW	936
Flat Base Truck:	
20x4.33R (6")	41,150
15x5.00S (7")	4,878
20x5.00S (7")	265,760
20x6.00T (8")	45,672
22x6.00T (8")	9,330
18x7.33V (9-10")	956
20x7.33V (9-10")	18,121
22x7.33V (9-10")	1,689
24x7.33V (9-10")	2,242
20x8.37V (11")	3,236
24x8.37V (11")	756
Semi D. C. Truck:	
16x4.50E	4,233
Tractor & Implement:	
12x2.50C	744
12x3.00D	6,128
19x3.00D	2,622
24x8.00T	1,689
36x8.00T	86
W8-24	3,082
W10-26	802
W10-28	710
DW9-38	3,076
DW11-26	741
DW11-28	181
DW11-30	119
DW11-36	125
Cast:	
24x15.00	96
TOTALS	686,205

Annual Index Available

Owing to the paper shortage, our annual index is not incorporated, as usual, in our October issue. Anyone, however, desiring copies of the index, covering Volumes 107-108 (October, 1942-September, 1943) of INDIA RUBBER WORLD, may secure them by phoning this office (MOhawk 4-1760) or writing to 386 Fourth Ave., New York 16, N. Y.

Statement of INDIA RUBBER WORLD

Statement of the ownership, management, circulation, etc., required by the Acts of Congress of August 24, 1912, and March 3, 1933, of INDIA RUBBER WORLD, published monthly at Philadelphia, Pennsylvania, for October 1, 1943.

State of New York } ss.
County of New York }

Before me, a notary public in and for the State and county aforesaid, personally appeared B. Brittain Wilson, who, having been duly sworn according to law, desposes and says that he is the Business Manager of INDIA RUBBER WORLD and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, Bill Brothers Publishing Corp., 386 Fourth Ave., New York, N. Y.; editor, Robert G. Seaman, 386 Fourth Ave., New York, N. Y.; managing editor, S. R. Hague, 386 Fourth Ave., New York, N. Y.; business manager, B. Brittain Wilson, 386 Fourth Ave., New York, N. Y.

2. That the owner is: Bill Brothers Publishing Corp., Caroline L. Bill, Raymond Bill, Edward Lyman Bill, all at 386 Fourth Ave., New York, N. Y.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1% or more of total amount of bonds, mortgages, or other securities are: None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

B. BRITTAIN WILSON,
Business Manager.

Sworn to and subscribed before me this 24th day of September, 1943.

[SEAL]

WM. A. LOW,
Notary Public, Queens Co. No. 1342, Reg. No. 138-L-5. Certificate filed in N. Y. Co. No. 641, Reg. No. 388-L-5.
(Commission expires March 30, 1945)

New X-Ray Unit

(*Continued from page 61*)

servable at any one time. The inspection unit is compact and easily moved from place to place in the laboratory or plant. It is approximately 69 inches high by 26½ inches wide by 24 inches deep, weighs about 425 pounds and takes up less than five square feet of floor space. North American Philips Co., Inc., Industrial Electronics Division, 419 Fourth Ave., New York, N. Y.

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EUROPE

GREAT BRITAIN

No Synthetic Rubber Production Yet

The progress of investigation of the production of synthetic rubber in England came up again recently in the House of Commons. The Parliamentary Secretary to the Ministry of Production stated that the Synthetic Rubber Committee had investigated various proposals for making synthetic rubber and rubber substitutes, but that no decision to produce synthetic rubber in bulk in Great Britain had been made.

It further developed that a British concern had made an offer to the Minister of Production to install a plant for the production of synthetic rubber in England, but that consent of the Minister could not be given until proper consideration had proved that the firm's confidence in its ability to produce synthetic rubber was fully justified.

To Combat Bureaucracy

The demands of wartime have favored a gradually growing tendency toward monopolistic control of industry which may become fully established unless suitable steps are taken in time to oppose it. T. Rogers, managing director of the Kelvin Rubber Co., recently declared. He fears that the monopoly may continue after the war and therefore urges all sections of the rubber industry, as well as haulage and allied motor trade interests, to unite in an organization which, as soon as peace has been declared, will fight any continuation of monopolistic control and strive for complete restoration of freedom of trade.

I.R.I. News

At the June 28 meeting of the Midland Section of the Institution of the Rubber Industry held in Birmingham, G. Gee spoke on "The Absorption of Oil by Rubber." At the July 26 session several papers were read: "The Properties of Some Unusual Accelerators", by G. W. Usherwood; "A B.S.I. Hardness Tester", by J. C. Hickman; and "Errors in Pendulum Testing for Resilience", by D. Bulgin.

The London Section Committee recently elected the following officers for 1943-44: chairman, George Martin; vice chairman, M. M. Heywood; honorary secretary, H. C. Baker. The following members have been elected to the Associateship and Licentiateship of the Institution of the Rubber Industry:

Associateship: C. W. Buckles, chief chemist, Pirelli General Cable Works, Ltd.; T. H. Marsden, executive responsible for proofing and treating textiles, William Warne & Co., Ltd.; J. H. Simms, chemist, I.C.I. Rubber Service Laboratories; Harold Taylor, head of latex department, I.C.I., Dyestuffs, Ltd.; C. W. Thompson, assistant chemist and rubber technologist, United Ebonite & Lorival, Ltd.

Licentiateship: John Robinson, Newton Heath Technical School; J. S. Logan, Newton Heath Technical School.

The program of meetings for the forthcoming session of the London Section of the I.R.I. follows: September 13, Questions and Answers, with Philip Schidrowitz, F. H. Cotton, T. R. Dawson, chairman, George Martin; October 11, "Manufacture and Production of Rubber Crumb", J. S. Tidmus, "Uses of Rubber Crumb as Applied to Tire Manufacture", H. E. Davis, "Rubber Crumb as a Compounding Ingredient", J. R. Scott; November 8, Discussion of GR-S Synthetic Rubber, to be opened by T. L. Garner; December 6, To be arranged; January 3, 1944, "Some Engineering Absurdities in the Rubber Industry", H. C. Young, Paper by G. B. Burnside (Ministry of Aircraft Production); February 7 and March 6, To be arranged; April 17, Annual general meeting, followed by illustrated talk, "Story of the Rubber Dinghy", by D. W. Seager.

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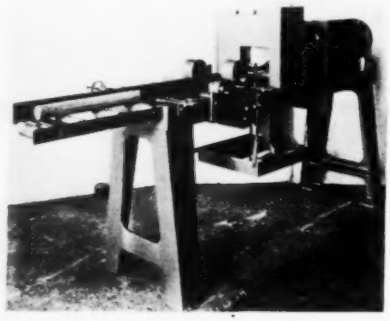

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Plastics Industries for Wales

The possibilities of developing industries in South Wales to supply various raw materials to the plastics industries are to be explored by a special committee recently formed at a meeting in Cardiff of the South Wales & Monmouthshire Industrial Development Association. At the meeting A. Caress, development director of I.C.I. (Plastics), Ltd., stated that Wales could produce chemical raw materials that included coal and carbide and also intermediate materials derived from coal. The special committee, made up of technicians and industrialists, is under the chairmanship of Councillor George Williams, O.B.E., Cardiff, who is also chairman of the Industrial Development Association; D. J. Davies, Cardiff, is committee secretary.

The Redux Process

A method for bonding light alloys and steel to each other and to wood by means of synthetic resin adhesives has been developed by Aero Research, Ltd. The synthetic adhesives resist water, oil, and gasoline; the resin is slightly thermosetting at temperatures over 100° C., but, if the joint has not suffered unusual strain, cooling is followed by recovery of strength. It is claimed that the new method, known as the Redux process, gives greater strength than riveting and produces more satisfactory joints especially with aluminum, chromium, iron, and steel. It is less suitable for brass, tin and zinc. The advantages of the new process permit wider application of resin bonding and open up new fields for important developments in airplane construction and in industrial design. The process is being kept secret by government order and is available only to firms engaged in essential war work.

Notes

To show the British people how conservation, reclamation, standardization, and labor saving devices have helped Britain, formerly so largely dependent on seaborne trade, to increase munitions output 300% since 1940 with less than half the prewar raw materials, an exposition, "The Story of a Great Achievement", was arranged and opened on August 9. Among the examples of savings was noted tire standardization by which ten tires can now be made from 200 pounds of rubber, whereas formerly this amount was used for seven tires.

Wholesale dealers and importers handling rubber footwear have been asked by the Board of Trade to make returns of the quantity and types of rubber boots of Hong Kong manufacture they may have on hand. Retailers have been asked to make similar reports, at the same time mentioning the condition of the stock, and send them in to their normal suppliers who will pass on the information to the Board.

The Northern Section of the Institute of the Plastics Industry met on June 5, when a paper on "Thermoplastics" was presented by A. Renfrew, of I.C.I. (Plastics), Ltd.

At a Glasgow meeting of the Institute, T. L. Birrell, chairman, spoke on "Some General Aspects of the Plastics Industry." On this occasion also, a Glasgow Section of the Plastics Industry was formed.

FRANCE

The plastics manufacturers of Germany, France, and (at the time) Italy are said to have formed a plastics association with headquarters in France. The aim of the association will be to formulate standards for all Europe; international standards for plastics will be specified, definitions for raw materials and products issued, and standard tests, applicable to the whole continent, will be fixed.

Meantime reports regarding the important Saint-Denis dyestuffs and chemical company state that its factories have not been able to work regularly and that numerous orders have had to be rejected.

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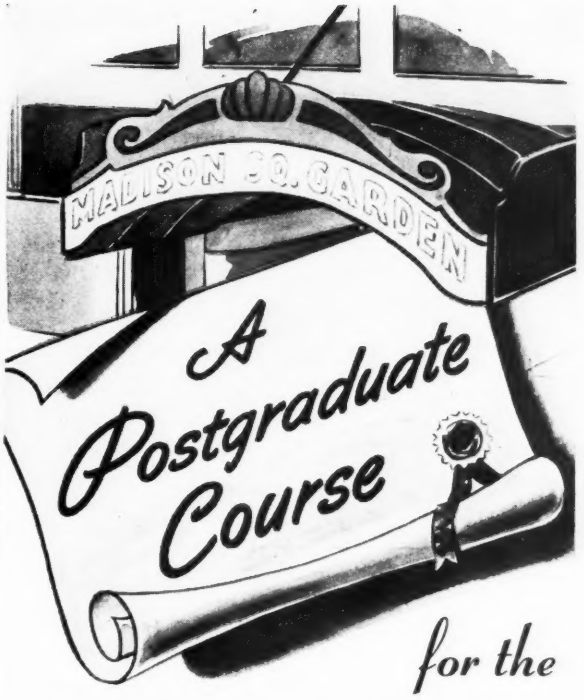

for the

RUBBER INDUSTRY

Under one roof, in Madison Square Garden, New York, this year's Exposition of Chemical Industries will present a remarkable educational opportunity. There, during the week of December 6-11, 1943, members of the phenomenally-growing synthetic rubber industry will find the equivalent of a post-graduate course in chemistry and chemical engineering applied to their own problems.

Available here will be a wealth of ideas for speeding production in the new synthetic rubber plants that will supply the rubber products to meet the needs of war and those of the victorious peace to come. Synthetic Rubber—a brand-new industry—is bound to undergo changes—many foreshadowed by the exhibits at the Exposition.

Plan to use to the utmost this arsenal of workable ideas. You will find more "show-how", more factual data, because this year's Exposition is more concentrated than ever before. It will be an information center, manned by technical representatives of the country's leading producers of raw materials and builders of processing equipment.

Admission to the Exposition of Chemical Industries is by invitation and registration. As the general public is not admitted, you will find here every facility for a thorough-going study of the chemical and engineering developments of prime interest to you. By all means come—and bring your associates.

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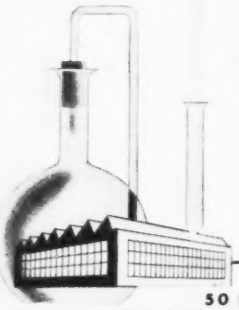

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SWEDEN

In various ways Sweden is attempting to cope with the rubber shortage. Much experimental work has been done on the production of synthetic rubber, and it appears that several companies have begun to manufacture on a commercial scale. Output at this stage, however, is necessarily still small.

Some time ago it also was decided to plant *kok-saghyz*, and Sweden has hopes that by 1944 she will have a crop of 27,000 kilograms of one-year-old root, and 38,000 kilograms of two-year-old root, besides a planted area of 230 hectares. Since the rubber content of the older root is estimated at 3%, and of the younger at 2%, it is obvious that not more than a drop in the bucket, so to speak, will be obtained. Evidently then, there is little chance of appreciably easing the rubber situation for some time to come, by the production of natural *kok-saghyz* rubber or synthetic rubber, especially as regards the manufacture of tires, and the difficulty must be overcome by other means.

Latest reports state that work is now in progress to determine whether wooden tires could to some extent replace rubber ones in the transportation of timber over bad forest roads, and under similar conditions, where rubber tires are subjected to exceptionally severe wear and tear. To this end, it is said, 200 trucks have been equipped with wooden tires on the rear wheels; the tires are made up of a large number of blocks suitably fitted together.

Meanwhile, however, the Swedish Government has been forced to order that 11,000 trucks be taken out of service; about 3,000 of these may be able to continue on the road a little longer by changing to tires from stored private cars. The total number of trucks hitherto in operation was roughly 31,000.

Sweden has been experimenting with various synthetic products to produce a suitable soling material as a substitute for leather or natural rubber. A nitrocellulose product proved unsatisfactory, but the Nordiska Rubber Factory is credited with the development of a new material in which leather scrap is used, which, it is claimed, can be worked like leather. The same factory is said also to be producing a synthetic rubber soling material, Modotiol, which is meeting with success since it is expected to produce large numbers of soles. However the extent of the output will depend on the possibility of increasing production of synthetic rubber, which now is at the rate of 100 tons per year.

FINLAND

The Finnish Rubber Factory has been made the central rubber sales organization for the Finnish rubber industry which has been under strict control for some time. It seems that private business may not have more than five kilograms of rubber in stock and that dealers must report regularly on their holdings, imports, production, and sales.

AFRICA

Wild Rubber of Tropical Africa

Until the development of the plantation rubber industry in the East, Africa ranked after South America as an important producer of wild rubber. In point of variety and number of plants yielding rubber, however, tropical and sub-tropical Africa seem to surpass the Americas. Experts have found hundreds of different species of plants which yield rubber in varying amounts and quality, which are discussed in a recent issue of the *Transactions of the Institution of the Rubber Industry* by Geo. Martin.

Mr. Martin divides the African product into three main groups: rubber which, when clean and dry, contains 75% or more of caoutchouc; "resinous rubber" containing 40-75% caoutchouc; and

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rubbery resin with 10-40% caoutchouc. Among the indigenous plants in the first group are *Funtumia elastica*, formerly also known as *Kickxia*; and certain species of *Landolphia*, *Clitandra*, and *Carpodinus*. Besides are *Hevea*, *Ceara*, and some *Ficus elastica* and *Castilloa*, which are of foreign origin. For the present the native plants are the most important rubber producers in Africa.

Funtumia elastica is a tall forest tree which grows throughout the moist hot regions of tropical Africa. Two other species of *Funtumia* are also known, but these yield only a resinous latex containing little or no rubber. *Landolphia*, *Clitandra*, and *Carpodinus* are thick and strong climbing vines frequently of great size and widely distributed over a large part of the continent, from Abyssinia and French West Africa in the north, almost to South Africa in the south. When the vines grow in districts where are no large trees for their support, they sometimes form underground stems a few inches below the soil, which ramify in all directions often for a considerable distance. *Landolphia thollonii* and *Carpodinus lanceolata* especially have this tendency and produce *Angola* root rubber. The best known of the vines are the *Landolphias*, of which there are at least 20 species, but the chief rubber producers are *Landolphia heudolotti* and *owariensis* in West Africa and *L. kirkii* and *ugandensis* in East Africa.

Tapping and Yields

Funtumia elastica has a straight trunk which does not branch except at great height; consequently tapping is frequently carried out up to height of 60 feet on the trunk, usually on the herringbone system, which cuts six to 12 inches apart. Tapping can be done only twice a year; each tree yields about ¼ pound per tapping.

The vines are usually tapped by making numerous cuts in the stem, a process which also is not performed oftener than twice a year, with yields ranging from one ounce to four ounces of dry rubber per vine per tapping, although occasionally as much as ½ pound is obtained. Sometimes the main stem of the vine is severed close to the ground, and the vine cut into pieces about 12 inches long, from which the latex is allowed to drain while any rubber still left in the bark is removed by pounding and beating. Underground stems are torn up, dried in the sun to coagulate the rubber, and cut into pieces 6-12 inches long. The rubber is extracted by a process involving pounding which is alternated by soaking in hot water.

Handling and Coagulation

The preparation of the rubber from the different types of latices obtained from the various plants offers certain difficulties, as obviously a standard method cannot be applied to all. But it is hoped that since technical experts are taking the matter in hand, the quality of the product will improve rapidly.

Funtumia elastica has a remarkable stable latex which can be kept for a long time without the addition of preservatives. It cannot be coagulated by the simple addition of acetic or formic acid, like *Hevea*, but almost invariably seems to require a certain amount of heating to induce fairly rapid coagulation. The latex is sometimes poured into shallow, soft wood trays or into holes in the ground and allowed to coagulate spontaneously, a process which in the first case may take a few days and in the latter some weeks. The more usual method, however, is to dilute the latex and heat it in an earthenware pot over a slow fire, or to add boiling water to the latex, when a flocculent mass rises to the surface; the mass is removed by hand or scoop and formed into lumps, or cut into strips, dried, and wound into a large ball. On plantations the latex is boiled, and the coagulum thus obtained is rolled into sheet, but with this method is a risk of over-heating and hence of producing tacky rubber.

Attempts have been made to find chemical coagulants use tannic acid, mercuric chloride, formalin and alum, sometimes in combination with a little acetic acid, but dilution with water and heating are still required to obtain a coherent clot.

Vine latex is usually coagulated by heat, although acetic acid or acid plant juices may also be used to coagulate free-flowing latex of some of the *Landolphia species*. Vine rubber used to appear on the market in a variety of forms as balls, slabs, bracelets, niggers, twists, thimbles, cubes, lumps, biscuits, etc., according to the prevailing best methods of the different villages or tribes.

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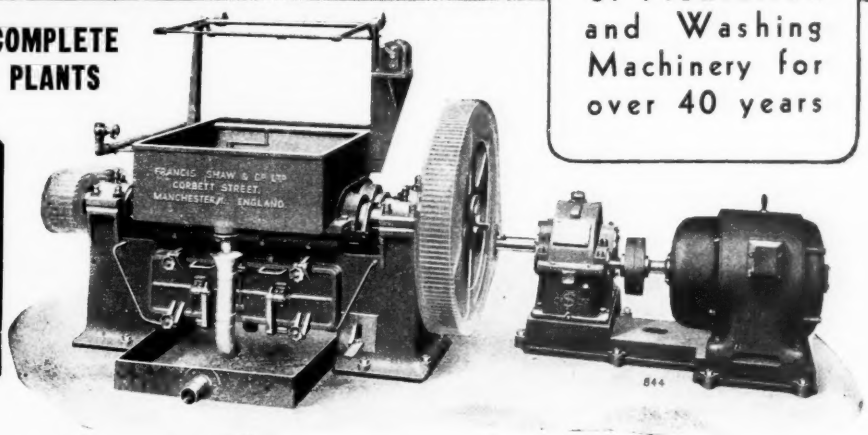

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tumia, *Hevea*, or *Ceará* and also rubber from some vines, are usually fairly clean, but other rubbers require washing, when the loss of weight is between 10-20%, and occasionally is even as high as 40%.

Properties

The African rubbers vary considerably in degree of plasticity, and, as a rule, the better the rubber, the less plastic it is, but on the whole, all are definitely softer than *Hevea*. *Funtumia*, *Ceara*, *Clitandra*, and a few *Landolphias* as *L. kirkii* and *ugandensis* vulcanize normally when well prepared and require only minor adjustments to yield good results. But other *Landolphias*, especially the root rubbers, are more difficult to vulcanize and require more powerful acceleration. Since *Funtumia* and the vine rubbers are deficient in fatty acids, this lack must be made up by the addition of the proper proportions of stearic acid.

The vulcanizing properties of the African rubbers, particularly in a pure mix, show astonishing variability, but mixes heavily loaded with carbon black, tread compounds, for instance, have properties more nearly like those of *Hevea*.

Probably the most serious disadvantage of wild African rubber is the rapidity with which it deteriorates when it is not vulcanized. Raw *Hevea* rubber may be kept for years without showing marked signs of deterioration, but the African product becomes tacky and resinous in spots after a few weeks. Even after vulcanization, there is a marked difference in the aging properties of *Funtumia* sheet, for instance, and *Hevea*. In comparatively pure mixes the latter was found to have about 50% longer life than the former. But it is thought that the difference may be smaller in technical mixes.

Notes

From South Africa appear reports of recent considerable progress in the chemical industry, although the advances are not very extensive. Among the products now being produced here for the first time are sulphonated oils, a cellulose adhesive developed by the Leather Industries Research Institute, Grahamstown, plastic products from domestic materials, and an impregnating compound for waterproofing tents and canvas. New, too, is the plastic known as L.I.R.I. 568, which, when dissolved in a suitable solvent, can be used as a binder and stiffener for fibrous materials. This plastic, also a discovery of the Research Institute, was originally intended for stiffening the insoles of army boots, an application which continues to find favor. Whiting for the paint, rubber, and other industries is now being made here on an increasing scale as well as red oxides, kaolin, and a substitute for carbon black.

Most of the rubber exported from Belgian Congo has hitherto been wild rubber, but in recent years the area of plantation rubber, notably *Hevea*, has been increasing. Europeans own estates reported to total 45,000 acres, of which 30,000 acres have been planted in the Province of Stanleyville; it is further intended to plant an additional 30,000 acres of *Hevea* in this region. Besides a European organization is said to have cleared about 17,500 acres which it is to plant with seed being supplied by plane.

The native holdings total 5,000 acres.

On the basis of the low local yields, it is estimated that the present annual yield of estate rubber probably amounts to about 2000 tons; while wild rubber will account for a similar quantity.

In March, 1943, 750 tons of rubber was purchased in Leopoldsville, and of this 500 tons was wild rubber.

From the Portuguese East African Colony of Mozambique comes the report of the erection of a new rubber factory at Lourenço Marques. The factory, owned by the Fabrica Colonial de Borracha, has been equipped with machinery obtained from Portugal, and more than $80,000 has already been expended on the undertaking. For the time being footwear and heels will be the main products, but inner tubes for automobiles and bicycles are to follow in the near future, as well as other articles and rubber for retreading automobiles. Daily capacity is claimed to be 1200 kilograms of rubber and 600 pairs of shoes. At present 62 persons, eight of whom came from Portugal, are employed at the factory. So far the plant's only source of supply has been rubber obtained from native collectors in the Inhambane district. However Mozambique is said to be relatively rich in rubber as there are millions of untapped trees in the territory north of Manica and Sofala.

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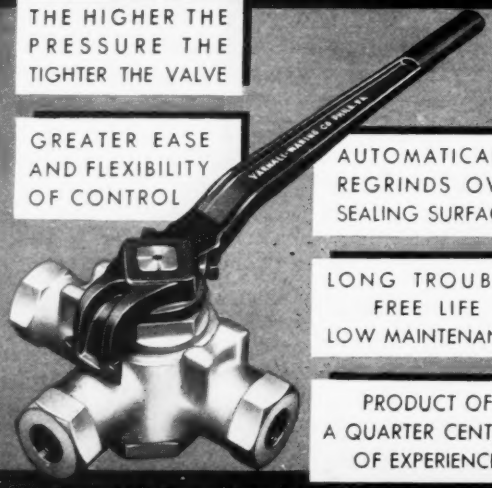

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INDIA

Some time ago a policy of cooperation between various universities in India and the Indian Central Jute Committee was decided on, and about 18 months ago the Committee approved financial grants to certain universities to further research work on Jute. Among the universities was the Calcutta University which undertook work on the possibility of utilizing jute and jute waste according to a process developed by B. C. Guha, professor of applied chemistry. A recent report by Dr. Guha and his assistant, B. D. Das, indicates that they have succeeded in making molding powders from jute waste from the mills by heating the waste under pressure and treating it with certain acids and other chemicals. The result is a thermosetting powder which can be molded after the addition of a small amount of plasticizer and subjecting to pressure of 3,000 pounds per square inch for three minutes at 150° C. The powder, for which the name Jutelite has been suggested, is dark in color, ranging from chocolate to brown and weighs very little; the molded products have a glossy surface and are hard enough to be drilled. The investigation of the physical and chemical properties is still in progress.

New molding powders have also been produced from shellac by the Indian Lac Research Institute. This is a development which opens up a new field for the use of shellac in the production of electrical goods and household articles.

In the London bureau of the Institute a process for hot spraying the lac has been worked out which is thought will have considerable commercial value.

There seems to be no limit to the number and variety of plants, other than the old-established species, that contain at least some rubber. Now such a plant has been discovered in South India. No details as to the kind of plant or the percentage of rubber it yields has been publicized, but it is learned that the Madras Agricultural Department plans to extract rubber from it.

AUSTRALIA

The Australian chemical industry, under the impetus of war conditions, is expanding to a remarkable degree and is branching out in various directions, according to the report of Imperial Chemical Industries of Australia & New Zealand, Ltd., covering the fiscal year ended September 30, 1942. In that period was begun the production of nitrobenzene and paranitro chlorbenzene, and the erection was commenced of plants for manufacturing aniline, diphenylamine, phenothiazine, trichlorethylene, carbon tetrachloride, and rubber chemicals. Guided by the parent company, the local branch is also to produce polyvinyl chloride and formaldehyde.

Recently British Industrial Plastics, which specializes in the production of aminoplastics, arranged with Elliotts & Australian Drug Proprietary, Ltd., to form a company, Beetle Elliott Proprietary, Ltd., which will manufacture and sell beetle resins and molding powders.

"Naval Stores and the Compounding of Synthetic Rubber." Hercules Powder Co., Wilmington, Del. 8 pages. A preliminary report on the use of various chemical products from pine wood as softeners and tackifiers in the compounding of GR-S is covered in this bulletin. These products include Staybelite resin, Poly-pale resin, Belro resin, and special new resinous materials developed by Hercules chemists for the synthetic rubber program. Comparative values in a typical GR-S tread stock have been compiled on tack, plasticity, resilience, compression set, tear test, heat build-up, flex cut-growth, and aged elongation for eight naval stores products.

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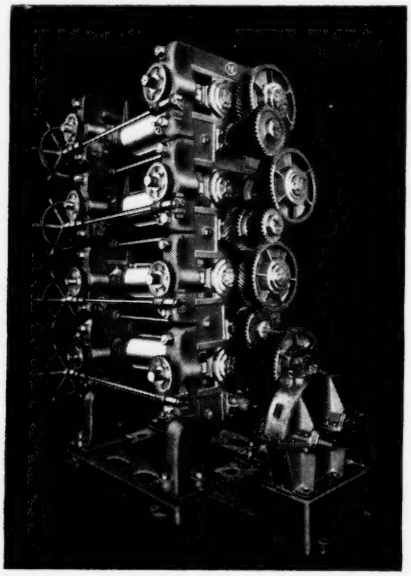

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Editor's Book Table

BOOK REVIEWS

"The Chemistry of Large Molecules." Edited by R. E. Burk and Oliver Grummitt. Published under the auspices of Western Reserve University, Cleveland, O. Interscience Publishers, 215 Fourth Ave., New York, N. Y. Cloth, 6 by 9 inches. 324 pages. Price $3.50.

This volume reports recent developments in the chemistry and physico-chemistry of plastics, rubbers, and fibers, as presented in the form of lectures at Western Reserve University by prominent scientists in their special fields. Each of these men presented two lectures. This gave each man an opportunity to present a substantial view of his work, and the two courses of twelve lectures each, though dealing with somewhat different, but definitely related fields, provided a connected course in which each lecture was given by a real expert. To aid in the problem of keeping abreast with the forward movement of science by those who were not able to attend these and other lectures, Western Reserve University has decided to publish them as part of a series appropriately entitled, "Frontiers in Chemistry", of which this particular publication is Volume I. In order to make up for the lack of personal contact enjoyed by the audiences of these lectures, a biographical sketch and photograph of each lecturer have been included.

The book presents the material as a series of eight articles, the first, on "The Mechanism of Polyreactions" by H. Mark, explains the method of developing once and for all, sets of general differential equations for the main types of polyreactions, after which these sets are integrated, and every individual reaction can then be treated as a special case of one of the general types. A discussion of the elementary steps of activation, propagation, and termination in a less formal manner is also given. The second article by the same lecturer, on "The Investigation of High Polymers with X-Rays", results in the presentation of this worker's attempt to correlate the properties of rubbers, plastics, and fibers based on data obtained by X-ray investigation. The third article, by Elmer O. Kraemer on "The Colloidal Behavior of Organic Macromolecular Materials", first treats of the diffusivity of colloids and then the viscosity of macromolecular solutions and leads up to the fourth article by this same lecturer, "The Ultra-Centrifuge and Its Application to the Study of Organic Macromolecules."

The fifth article, by Henry Eyring and his associates on "The Elastic-Viscous Properties of Matter", provides both a mathematical and general treatment to explain the behavior of these materials including natural rubber and other long-chain molecules. The appendix of this article gives in detail the mathematics used in developing some of the results presented. The sixth article, by Raymond M. Fuoss on "The Electrical Properties of High Polymers", reviews the physical picture underlying the Debye theory of polar molecules and shows how by means of this theory it is possible to calculate the electrical properties of polymers and their dependence on frequency and temperature.

"Organic Chemistry of Vinyl Polymers" is covered by C. S. Marvel in the seventh article, and the latest information of the structure of these polymers and copolymers given. The last article, by Emil Ott on the "Chemistry of Cellulose and Cellulose Derivatives", presents in some detail the most recent understanding of the reactions of cellulose and also shows how the physical properties of this material and its derivatives can be correlated qualitatively, at least, with the chemical nature of the molecules. This theoretical picture is, therefore, of inestimable value in the practical task of modifying the substance to fit the demands of industry.

Bibliographies are furnished at the end of each article by the authors, and a complete subject index has been provided by the editors.

"The Spirit of Enterprise." Edgar M. Queeny. Published by Charles Scribner's Sons, New York, N. Y. Cloth 5½ by 8 inches. 267 pages. Price $2.

This book represents a businessman's defense of the American system of free enterprise, written after making a thorough study

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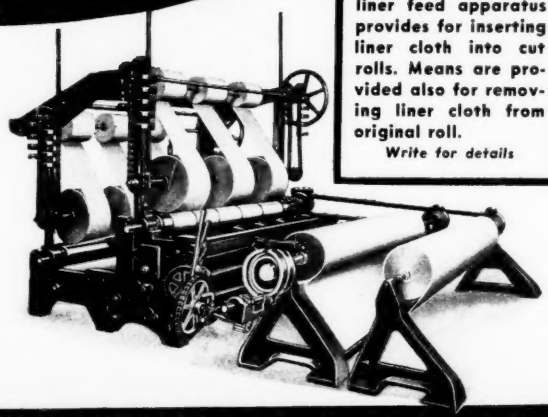

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of the progress already made by our individualistic American economy and the results of our recent experiments in a planned and collectivistic economy. The author, in tracing the developments of our economy during the past century or more under the free enterprise system and in emphasizing the unparalleled achievements under this system, does not overlook some of the accompanying less desirable results that were used by the collectivist planners to gain support for their moves for a strong, state-controlled system of economy.

Reviewing most particularly the happenings of the last ten years, Mr. Queeny shows how the growth of state socialism under the New Deal discouraged the use of venture capital by private industry because of the inability to estimate future trends. He declares that private enterprise never really was able to work out of the depression of the Thirties under the conditions as they were during this period. The difficulties, of course, disappeared with the requirements for goods and services during the war period, but the type of economy to be decided upon after the war is over is the major concern that must be given consideration now. A large portion of the book is given over to a discussion of the effect of the teachings of Thorstein Veblen on New Deal philosophy and the T.N.E.C. monographs which were supposed to have investigated thoroughly "the effect of tax, and other governmental policies on unemployment, on investment and the preservation of our free competitive economy as the American way of life", but fell short of the mark.

Mr. Queeny states that as a result of his investigation, his former beliefs slowly and finally evolved into the reasoned conclusion that the free enterprise system as opposed to a state planned and directed economy holds the most hope for the future of the country. He does not, by any means, find business faultless and says that businessmen should be willing to accept more of the classic conception of the free enterprise system. Business should recognize the justice of much well-deserved, although misdirected, criticisms by New Dealers and should accept remedies that go all the way in destroying all obstacles to free competition and open markets. Specific suggestions are made for the near future, and the author does not advocate any sacrifice of the social gains of the last decade.

"To realize the four freedoms", he concludes, "we need only one freedom—Freedom!"

NEW PUBLICATIONS

"Witco M.R. in GR-S (Buna S)." Report 43-4. H. F. Schwarz. Wishnick-Tumpeer, Inc., 295 Madison Ave., New York 17, N. Y. September, 1943. 20 pages. This report gives data to show the desirable effect of M.R. or hard asphalt on the physical characteristics of GR-S products and suggests variations in formulations which may be advantageous when using M.R. In a typical tread stock formula it is reported that M.R. may be used to accomplish the following results: make the uncured stock more plastic and thereby easier to process, increase the tensile strength slightly up to the addition of 20 parts of M.R.; increase greatly the resistance to growth of cracks due to flexing; increase the resistance to tear; increase greatly the elongation obtained at break; decrease greatly the effect of aging on lowering tensile strength, lowering elongation, and hardening of the stock; decrease the modulus; increase the tensile product; and decrease slightly the resilience. In this tire tread compound the effect of variations in sulphur, EPC black, and M.R. were studied. The bulletin, which gives the test results both in tabular and graphical form, is concluded with a study on ways in which high loadings of M.R. may be used with channel black to replace medium thermal (MT) black or SRF black in GR-S compounds for mechanical goods.

"Polyvinyl Acetate. Solid, Solution, and Emulsion." Technical Data Bulletin No. 4-243. Electrochemicals Department, E. I. duPont de Nemours & Co., Inc., Wilmington, Del. 2 pages. Available grades of polyvinyl acetate supplied in solid form, in methanol solution, and in water emulsions are mentioned. The properties of Du Pont polyvinyl acetates are listed, and technical details on compatibility, physiological properties, solubility, and plasticizers discussed. The uses of the material as an adhesive and as a coating and impregnating agent for paper, felt, straw, fabrics, and metals are also explained.

Laboratory Reports. R. T. Vanderbilt Co., 230 Park Avenue, New York, N. Y. **"Dispersed Tysonite."** July 1, 1943. 8 pages. The properties and uses of Dispersed Tysonite, the base material of which is a black, organic, rubber-like plastic and which is available as a moderately stable dispersion of about 55% solids in water, are described. The material either alone or in combination with small amounts of some of the numerous synthetic resins is being used for backing upholstery and as a binder for pile. Other uses are for combining fabrics or paper and as a rug backing.

"GR-S and GR-I in Proofing." July 1, 1943. 8 pages. This report gives the results of preliminary laboratory work on the compounding, processing and curing of GR-S and GR-I in light colored stocks for the proofing industry. Compound formulas and physical test results for both press and dry heat cures are included.

"Selenac in GR-S-Reclaim Compounds for Mechanical Goods." July 28, 1943. 8 pages. Various ratios of GR-S and reclaim in which the sulphurless Selenac-Altax curing combination in comparison with the curing combination of Altax, DPG, and sulphur is used for application in mechanical goods compounds, are shown in this bulletin. The superior heat aging of sulphurless Selenac compounds is emphasized.

"Statex B." Binney & Smith Co., 41 E. 42nd St., New York, N. Y. Bulletin No. 126. 2 pages. The properties of Statex B, a reenforcing carbon which produces tensile strength in GR-S approaching that of E. P. Channel Black while at the same time developing less heat and improved flex life, are explained in this bulletin. Tables show the variation of Shore hardness and rebound resilience with comparative loadings of Statex B and E. P. Channel Black.

"Suprex Clay in Buna S. General Compounding Characteristics." Bulletin No. 3. J. M. Huber, Inc., 460 W. 34th St., New York, N. Y. 10 pages. Information is contained in this bulletin on the effects of sulphur-accelerator ratios with one standard accelerator, additional stearic acid, amount of loading, and on the effect of representative classes of softeners and accelerators in order to provide a guide for the fullest utilization of hard clay in Buna S. The superiority of hard clay over soft clay in degree of reenforcement obtained in Buna S is emphasized. By means of high accelerator concentrations a practical curing rate with Suprex Clay at a non-blooming sulphur content of three to four parts has been worked out. The importance of the choice of the proper softener to obtain the best results is also stressed. The exact mixing procedures used are outlined.

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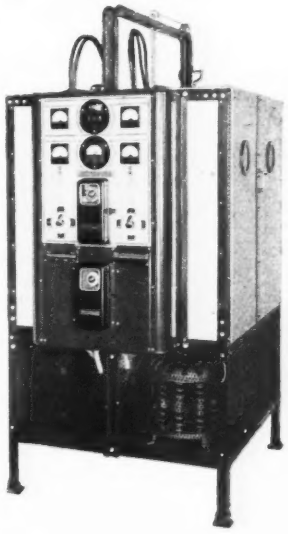

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"Perfected Insulating Machines." Pub. No. 332. John Royle & Sons, Paterson, N. J. 28 pages. This well-illustrated booklet gives many details of the construction and use of Royle insulating machines designed to apply a seamless, adhering layer of rubber or other plastic substance upon a continuous core passed through the machine. The machines are made in a variety of sizes and styles and embrace a capacity range from the smallest gages of single and stranded wire up to ponderous cables of several inches in diameter. The many applications of these machines include the coating of bead wire in tire manufacture, the laying of plys of rubber on braided fabric in the manufacture of garden hose, the manufacture of composition steering wheels and other articles molded over cores of various descriptions. Features of construction, such as the straight or side delivery, cylinders, stock screws, thrust bearings, head sections, and heating and cooling systems are discussed at some length. Specifications for the various sizes of machines are given as well as details concerning head fixtures for each size. The booklet concludes with information for ordering.

"Inspected Fire Protection Equipment and Materials." Underwriters' Laboratories, Inc., 207 E. Ohio St., Chicago, Ill. 16 pages. **"Franklin's Story."** Franklin Research Co., Philadelphia, Pa. 4 pages. **"Care and Maintenance of Combat Tires."** B. F. Goodrich Co., Akron, O. 46 pages. **"U. S. Royal Airplane Tires Technical Data and Engineering Information."** United States Rubber Co., 1230 Sixth Ave., New York, N. Y. 36 pages. **"Truck Tire Engineering Service."** Goodyear Tire & Rubber Co., Akron, O. 14 pages. **"Selected Films, Articles and Pamphlets on Highway Transportation in Wartime."** Automotive Safety Foundation, Tower Bldg., Washington 5, D. C. 24 pages. **"Recreation—a Resource of War."** Division of Recreation, Office of Community War Services, Federal Security Agency, Washington 25, D. C. 8 pages. **"270 Million Man-Days."** National Safety Council, Inc., 20 N. Wacker Dr., Chicago, Ill. 16 pages. **"Instructions for Using Hot Spot Indicators and Hot Spot Quenchers."** Coal Specialties Co., 50 Church St., New York, N. Y. 8 pages.

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NATURAL RUBBER PROCESSING

Its success lies in reducing the heat created by friction and "staying with" the compound instead of volatilizing during the mix which robs the stock of tack and causes it to "set" in the succeeding warming operation.

Galey Manufacturing Company
17700 LAKE SHORE BOULEVARD
CLEVELAND OHIO

Regular and Special Constructions of

COTTON FABRICS

Single Filling Double Filling
and

ARMY
Ducks

HOSE and BELTING
Ducks

Drills

Selected
Osnaburgs

Curran & Barry
320 BROADWAY
NEW YORK

Market Reviews

COTTON & FABRICS

NEW YORK COTTON EXCHANGE CLOSING PRICES — WEEK-END

	July 31	Aug. 28	Sept. 4	Sept. 11	Sept. 18	Sept. 25
Futures						
Oct.	19.85	20.28	20.15	20.20	20.38	20.38
Dec.	19.70	20.13	20.03	20.04	20.13	20.09
Jan.	19.60	20.08	20.00	19.97	20.02	20.01
Mar.	19.51	20.09	19.96	19.90	19.96	19.92
July		19.76	19.67	19.63	19.60	19.51

New York Quotations

September 23, 1943

Drills

38-inch 2.00-yard	yd.	
40-inch 1.45 yard		
50-inch 1.52-yard		$0.29
52-inch 1.85-yard		.23⅞
52-inch 1.90-yard		.23223/.2325
52-inch 2.20-yard		.20511
52-inch 2.50-yard		.185
59-inch 1.85-yard		.23851

Ducks

38-inch 2.00-yard D. F.	yd.	.215/.22⅝
40-inch 1.45-yard S. F.		.2975
51½-inch 1.35-yard D. F.		.335
72-inch 1.05-yard D. F.		.43/.45
72-inch 17-21 ounce		.48⅞
Mechanicals		
Hose and belting	lb.	.4275
Tennis		
51½-inch 1.35-yard	yd.	.315
51½-inch 1.60-yard	yd.	.27⅛
51½-inch 1.90-yard	yd.	.23⅛

Hollands — White

Blue Seal		
20-inch	yd.	.135
30-inch		.2425
40-inch		.27
Gold Seal		
20-inch	yd.	.145
30-inch		.2575
40-inch		.29
Red Seal		
20-inch	yd.	.1225
30-inch		.22
40-inch		.245

Osnaburgs

40-inch 2.34-yard	yd.	.155⅝
40-inch 2.48-yard		.14⅝
40-inch 2.56-yard S. F.		.14578
40-inch 3.00-yard		.1275
40-inch 7-ounce part waste		.15
40-inch 10-ounce part waste		.21⅜
37-inch 2.42-yard clean		.1525

Raincoat Fabrics

Cotton		
Rombazine 64 x 60	yd.	
Plaids 60 x 48		
Surface prints 64 x 60		
Print cloth, 38½-inch, 64 x 60		.08971
Sheeting, 40-inch		
48 x 48, 2.50-yard	yd.	.16200
64 x 68, 3.15-yard		.13968
56 x 60, 3.60-yard		.11944
44 x 40, 4.25-yard		.09764
Sheetings, 36-inch		
48 x 44, 5.00-yard	yd.	.08600
40 x 40, 6.15-yard		.06991

Tire Fabric

Builder		
17¼ ounce 60" 23/11 ply Karded peeler	lb.	.48
Chafer		
14 ounce 60" 20/8 ply Karded peeler	lb.	.48
9¼ ounce 60" 10/2 ply Karded peeler	lb.	.45
Cord Fabrics		
23/5/3 Karded peeler, 1⅛" cotton	lb.	.44
15/3/3 Karded peeler, 1⅛" cotton	lb.	.42
12/4/2 Karded peeler, 1⅛" cotton	lb.	.42
23/5/3 Karded peeler, 1¼" cotton	lb.	.44
Leno Breaker		
8¾ ounce and 10¾ ounce 60" Karded [illegible]	lb.	.45

SEPTEMBER cotton enjoyed only thin trading. Italy's surrender sent the market reeling, but the President's subsequent long-war-ahead message to Congress steadied things considerably. Traders remained inhibited, however, by the overall favorable tenor of the war news. Also trading was stagnated by reports that the tropical hurricane which was expected to affect the new crop in Texas and Louisiana had shifted to lessen the threat to these crop areas.

The New York Cotton Exchange Service Bureau estimates the stock of all cottons in this country as of August 31 at 21,005,000 bales, inclusive of the unpicked portion of the crop. The domestic stock on August 31, 1942, was 22,030,000 bales, and two years ago, 21,709,000. The stock at the end of August 1943, was the smallest end-August stock since the 16,771,000 bales in 1936.

Cotton consumed during August, according to the Census Bureau, totaled 842,260 bales of lint cotton and 108,166 bales of linters, against 924,915 and 122,741 bales, respectively, in August, 1942. Price ceilings for linters produced after August 1 were adjusted by OPA so that farmers will receive the same average return they obtained on their last year's crop. The ceiling on chemical cotton linters is raised to $3.80 a 100 pounds from the previous level of $3.50. On hull fibers the new rate is $3.09, compared with the former rate of $2.85.

Indications from the South were that the basis during the present crop movement has tended to weaken: whereas last year at this time the basis had been strengthening. The trade feels this is due to the high quality of this year's crop in comparison to last year's 15/16-inch cotton, which was a specialty staple of a generally poor grade.

The price of 15/16-inch spot middling grade dropped from 21.21¢ on September 1 to 21.04¢ on September 4, then rose to 21.19¢ on the seventh, only to slip down to 20.98¢ six days later. September 14 boasted 21.08¢, which fell to 20.99¢ on September 16, climbed to 21.23¢ on September 21, and closed at 21.61¢ on September 30.

Fabrics

The export trade has been seeking about 150,000,000 yards of cotton goods, 17,000,000 of combed items and the remainder carded, and including sizable quantities of sheetings and print cloths, for shipment to South America on A-2 ratings. Current reports suggest that to date only about 10,000,000 yards of the total have been lined up. The entire amount is for shipment over the year which began September 1, certified as needed by South American governments and approved by the Office of Economic Warfare.

The cotton duck situation indicates that the War Production Board in making available civilian supplies of Army, ounce, single, and double filling descriptions, did not include any plied yarn types.

Rubber manufacturers have cased their demand for sheetings as a result of the completion of the Quartermaster's raincoat procurement for the balance of 1943. But the insulation cable industry's demand for sheetings is still acute, with no alleviation in sight.

Raincoat manufacturers continue in need of cloth for civilian business and will buy any-type cloth they consider suitable regardless of price or construction. The reason, of course, is that most mills are still working 100% on government orders and have very small yardage to offer for non-military channels.

Twelve producers of cotton and rayon tire cord and rayon fuel cell yarns were directed by the WPB to operate all their facilities, beginning October 1, for the maximum production of these cords and yarns regardless of any orders, regulations, or directives to the contrary, in order to assure maximum production of cotton and rayon tire cord for the tire production program and rayon fuel cell yarns for self-sealing gas tanks. The directive was issued pursuant to Order L-99, which regulates the use of cotton textile machinery. The terms of the directive are to remain in effect until expressly revoked in writing. However any producer who wishes to be relieved from the requirements of the directive because they interfere with his production of other essential products may appeal to the Textile Division of the War Production Board, Washington, D. C., Reference L-99. Until such appeals are granted the terms of the directive will remain in effect.

General Preference Order M-91—Cotton Duck—was amended September 6 to ease restrictions on certain types of duck for civilian use. The original order had been issued to conserve all cotton duck production and inventories for the Armed Forces and certain industrial uses, but increased working hours and conversion of additional facilities for the manufacture of duck make possible some surplus for civilian use. The order embraces the following types of duck: shelter tent, numbered (wide or sail), narrow or naught, hose or belting, harvester, plied yarn filter duck and twills, and chafed fabric.

Scrap Rubber Ceilings

Inner Tubes†	¢ per Lb.
No. 2 passenger tubes	7¾
Red passenger tubes	7½
Passenger tubes	6

Tires‡	$ per Short Ton
Mixed passenger tires	20.00
Beadless passenger tires	26.00
Solid tires	36.00

Peelings†	
No. 1 peelings	47.50
No. 2 peelings	47.50
No. 1 light colored (zinc) carcass	52.50

Miscellaneous Items‡	
Air brake hose	25.00
Miscellaneous hose	17.00
Rubber boots and shoes	33.00
Black mechanical scrap above 1.15 sp. gr.	20.00
General household and industrial scrap	15.00

† All consuming centers except Los Angeles.
‡ Akron only.
‡ All consuming centers.

COTTON
GOES TO WAR

From the herringbone twills used in making camouflage uniforms, to sheets, towels and duck used for their tents, cotton helps protect and care for men on the fighting fronts. This is another and very important part of cotton's contribution to our war effort.

Because cotton fabrics can and do play such an important part in the war, supplies of our SHAWMUT HOSE and BELTING DUCK are available only to those customers meeting conditions of general preference order M-91.

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It is a cause for gratification to us that nine of the mills we represent have been awarded the Army-Navy "E"

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FAIRFAX MILL
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CHEMIST—TIRE, TUBE, OR MECHANICAL. LABORATORY, control, or research. Excellent opportunity with well-established organization located in Pennsylvania. Reply all details first letter. Address Box No. 662, care of INDIA RUBBER WORLD.

CHEMIST-ASSISTANT CHIEF—OPENING IN MEDIUM-sized organization, either laboratory or plant. Tires and press goods. 100% defense with excellent post-war opportunity. Investigate if not now employed at your highest skill. All replies strictly confidential during all negotiations. Address Box No. 663, care of INDIA RUBBER WORLD.

PRODUCTION SUPERVISOR — TIRES, TUBES, mechanical goods. Opening for a high-grade director of plant activities. 100% defense with attractive post-war opportunity. Salary commensurate with ability. Address Box No. 664, care of INDIA RUBBER WORLD.

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TIRE DIVISION SUPERINTENDENT. WIDE-AWAKE MAN TO take charge of Stock Preparation, Tire Building and Curing Departments. Must have good background of training and experience, must be able to work constructively with labor. A person with working knowledge of Goodrich Pan Tray Tire Building Machines preferred. Plant located in Ohio. Salary commensurate with ability. Address Box No. 667, care of INDIA RUBBER WORLD.

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TUBE DIVISION SUPERINTENDENT. MEDIUM-SIZED PROGRESsive tire company in Ohio. Have opening for tube man with good training and experience. Must know operations and be able to deal satisfactorily with both men and women. A person with a creative type of mind preferred. Salary in accordance with qualifications. Address Box No. 668, care of INDIA RUBBER WORLD.

CHEMIST FOR RESEARCH WORK. 3 TO 4 YEARS' EXPERIENCE in rubber, synthetics, or plastics. Excellent opportunity in a well-equipped laboratory near Boston. State qualifications and salary expected. Address Box No. 670, care of INDIA RUBBER WORLD.

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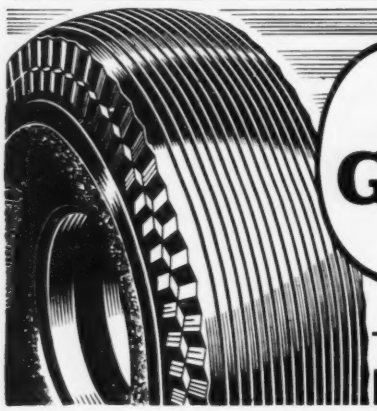
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Look for this emblem on tires recapped by the Kraft System
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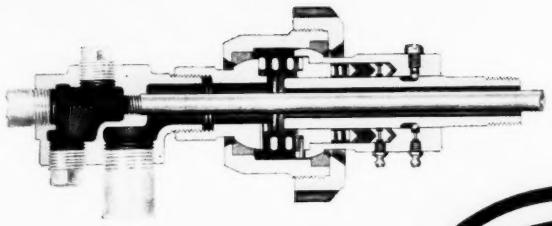
(Classified Advertisements Continued on Page 104)



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All types of latex compounded to meet customer's individual requirements.
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These are all factors vital in the selection of raw material and the control of your processes to attain the required modern Standards of Quality in the Finished Product. Universally adopted.

It is economic extravagance to be without these instruments. Used free handed in any position or on Bench Stands, convenient, instant registrations, fool proof.

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ALL STEEL ALL WELDED
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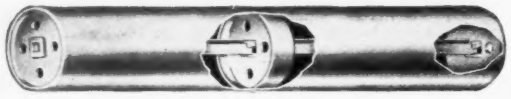

4" 5" 6" 8" 10" 12" diameters, any length.
Besides our well known Standard and Heavy Duty Constructions, we can supply light weight drums made up to suit your needs.
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FOR EXTENDING RUBBER
SOUTHLAND CORK COMPANY
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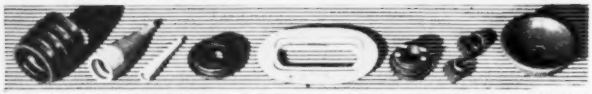
RAND RUBBER CO. BROOKLYN, N. Y. U. S. A. MFRS.



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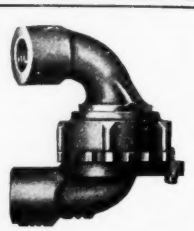

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Page

A

Adamson Machine Co., The ... 29
Advance Solvents & Chemical Corp. ... 83
Akron Equipment Co., The ... 92
Akron Standard Mold Co., The ... 89
Albert, L., & Son ... 105
Aluminum Co. of America ... 10
Aluminum Ore Co. ... 10
American Cyanamid & Chemical Corp. ... 87
American Resinous Chemicals Corp. ... 75
American Zinc Sales Co. ... 25
Atlas Electric Devices Co. ... 97

B

Baldwin Southwark Division, The Baldwin Locomotive Works ... 24
Barco Mfg. Co., Not Inc. ... 103
Barr Rubber Products Co., The ... 104
Barrett Division, The, Allied Chemical & Dye Corp. ... 18
Barry, Lawrence N. ... 105
Beacon Co., The ... 94
Binney & Smith Co., Insert, 53, 54
Black Rock Mfg. Co. ... 30
Bonwitt, Eric ... 105
Brockton Tool Co. ... —
Brooklyn Color Works, Inc. ... 96

C

Cabot, Godfrey L., Inc., Front Cover
Cambridge Instrument Co., Inc. ... 97
Cameron Machine Co. ... 95
Canfield, H. O., Co., The ... 94
Carey, Philip, Mfg. Co., The ... 94
Carrier Corp. ... 13
Carter Bell Mfg. Co., The ... 84
Chemical & Pigment Co., The
Chemical Industries, 19th Exposition of ... 85
Claremont Waste Mfg. Co. ... 90
Cleveland Liner & Mfg. Co., The ... Back Cover
Colonial Insulator Co., The ... 84
Columbian Carbon Co., Insert, 53, 54
Continental Carbon Co. ... 23
Continental-Mexican Rubber Co., Inc. ... 98
Curran & Barry ... 99

D

Davol Rubber Co. ...
Dunning & Boschert Press Co., Inc. ... 103
du Pont, E. I., de Nemours & Co., Inc., Inside Front Cover

E

Eagle-Picher Lead Co., The ... 95
Erie Engine & Mfg. Co. ... 8
Exact Weight Scale Co., The ... 95

F

Farrel-Birmingham Co., Inc. ... 15
Flexo Supply Co., Inc. ... 104
French Oil Mill Machinery Co., The ...

G

Galey Manufacturing Co. ... 99
Gammeter, W. F., Co., The ... 104
General Atlas Carbon Division of General Properties Co., Inc. ... 28
General Tire & Rubber Co., The ... 102
Givaudan-Delawanna, Inc. ... 83
Glyco Products Co., Inc. ... 88

H

Hall, C. P., Co., The ... 91
Herron Bros. & Meyer ... 28
Heveatex Corp. ... 103
Home Rubber Co. ... 93
Huber, J. M., Inc. ... 34
Hycar Chemical Co. ... 7

I

International Pulp Co. ... 105
Interstate Welding Service ... 26

J

Jacoby, Ernest, & Co. ... 96
Johnson, S. C., & Son, Inc. ... 82

M

Magnetic Gauge Co., The ... 90
Marine Magnesium Products Corp. ... 32
Mercer-Robinson Co., Inc. ... 86
Meyercord Co., The ... 81
Moore & Munger ...
Morris, T. W., Trimming Machines ...
Muehlstein, H., & Co., Inc. —

N

National-Erie Corp. ... 93
National Rubber Machinery Co. ... 71
National Sherardizing & Machine Co., The ... 105
Naugatuck Chemical Division of U. S. Rubber Co. ... 5
Neville Co., The ... 16
New England Butt Co. ...
New Jersey Zinc Co., The ...
North American Philips Co., Inc. ... —

P

Pennsylvania Industrial Chemical Corp. ...
Pequanoc Rubber Co. ... 12
Philadelphia Rubber Works Co., The ... —
Pittsburgh Plate Glass Co., Columbia Chemical Division

R

Raud Rubber Co. ... 104
Rare Metal Products Co. ... 88
Reichhold Chemicals, Inc. ... —
Resinous Products & Chemical Co., The ... 77
Revertex Corporation of America ... 95
Robertson, John, Co., Inc. ... 4
Royle, John, & Sons ... 11

S

St. Joseph Lead Co. ... 14
Schulman, A., Inc., Inside Back Cover
Scott, Henry L., Co. ... 94
Shaw, Francis, & Co., Ltd. ... 89
Shore Instrument & Mfg. Co., The ... 104
Skelly Oil Co. ... —
Snell, Foster D., Inc. ... 102
Southland Cork Co. ... 104
Stamford Rubber Supply Co., The ... 93
Stanco Distributors, Inc. ... 73
Standard Chemical Co. ... 31
Stanley Chemical Co., The ... 6
Stauffer Chemical Co. ... 30
Sun Oil Co. ... —

T

Taylor Instrument Cos. ...
Thiokol Corp. ... 27
Thropp, William R. & Sons Co. ... 33
Timken Roller Bearing Co., The ... 79
Titanium Pigment Corp. ... 22
Turner Halsey Co. ... 17

U

Union Bay State Co. ... 86
United Carbon Co., Inc., Insert, 19, 20
United Rubber Machinery Exchange ... 105
United Shoe Machinery Corp. 32
Utility Manufacturing Co. ... 84

V

Vanderbilt, R. T., Co., Inc. 36

W

Wade, Levi C., Co. ... 96
Wanted and For Sale, 102, 104, 105
Warwick Chemical Co. ... —
Wellington Sears Co. ... 101
Whittaker, Clark & Daniels, Inc. ... 96
Williams, C. K., & Co. ... 98
Wilmington Chemical Corp. ... 9
Wishnick-Tumpeer, Inc. ... 3
Wood, R. D., Co. ... 21

Y

Yarnall-Waring Co. ... 92

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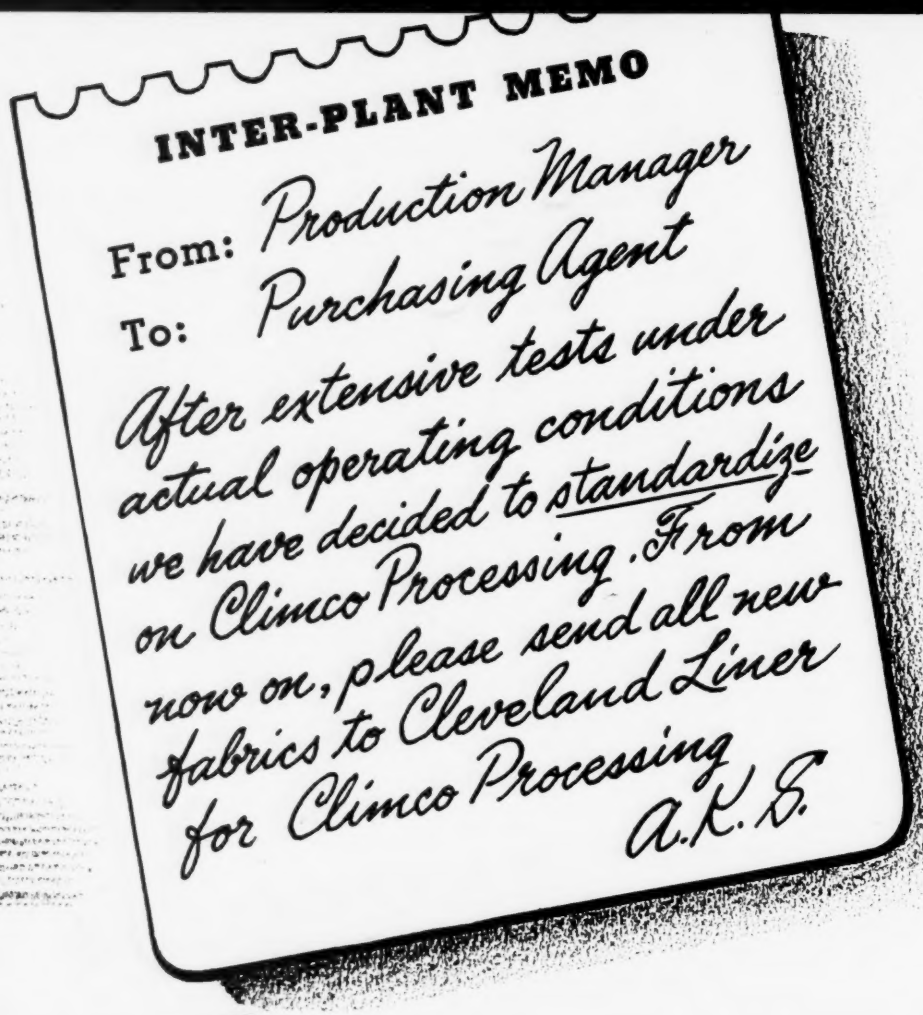
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